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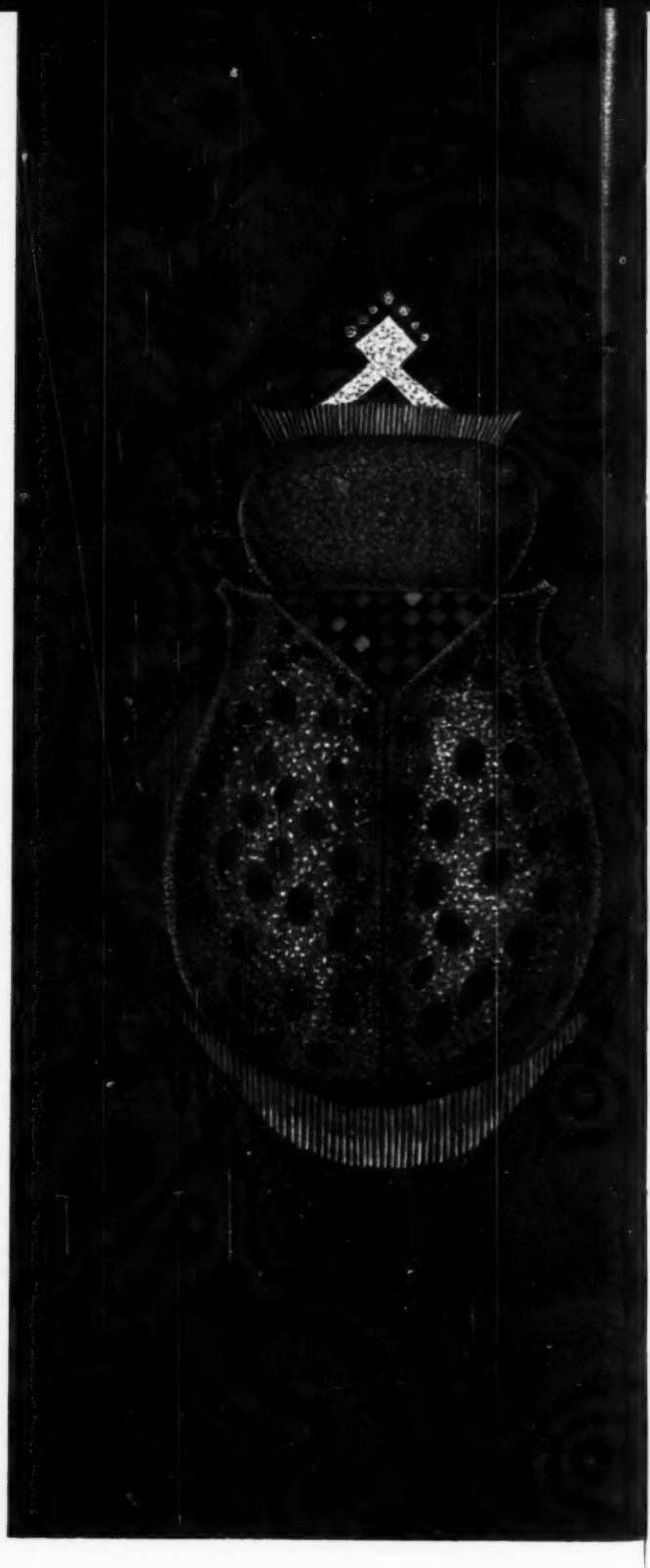

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Volume 48 October 19, 1959 No. 21

DURABLE CREASES PRODUCED IN COTTON AND RESIN-FINISHED COTTON FABRICS BY AN ALKALI PROCESS

WILSON A REEVES and CHARLES H MACK

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A process is described for imparting durable creases to cotton fabrics. The process utilizes mercerization strength alkali solutions and is applicable to most types of resin-treated and crosslinked fabrics, as well as to unfinished cotton fabrics. Creases are produced by moistening the area to be creased with alkali solution, then ironing-in the crease with a hot iron. Creases produced by the process remain sharp after many launderings.

INTRODUCTION

THE NEED for durable creases in household and apparel fabrics has become more important as true "wash-and-wear" finishes have developed. The term "wash-and-wear" implies that goods are satisfactory for use after washing and drying and need not be ironed or even touched up before use. Some of the current finishes properly applied on cotton produce excellent "wash-and-wear" products which do not need ironing. Certainly at the current rate of progress real "wash-and-wear" goods will be the usual within a short time. Since these textiles will not be ironed, it will be necessary that they contain durable creases at the desired locations to improve appearance and meet the prevailing fashion. The purpose of this paper is to present a laboratory method for imparting durable creases into untreated cotton and into resin-finished cottons.

Some earlier work at this Laboratory demonstrated that durable creases could be put into cotton fabrics by either of three techniques. The first was simply to moisten the fabric with a solution of dimethylol cyclic ethyleneurea (CEU) and an appropriate acid catalyst and then to iron in the crease at the desired location (*9*). The second consisted of creasing goods that already contained an N-methylol type resin by a recuring process (*10*). In this technique, the resin-treated fabric was moistened with an acid catalyst, and then the crease was ironed in. This was possible because the acid hydrolyzed some of the resin-cellulose cross-links, and then, as the material became dry, new cross-links were formed which maintained the fabric in a creased condition. Durable creases have also been put into cotton after acetylation (*2*). Acetylated cotton has some thermoplastic properties which enable it to be creased by pressing and steaming.

"Wash-and-wear" finishes that are not based upon N-methylol resins, such as those imparted with epoxy and aziridinyl compounds, are not subject to creasing by hydrolysis with acid catalysts and recuring of the finish. At present, these newer types of finishing agents appear very encouraging as "wash-and-wear" finishes for cotton fabrics. In general, they are very durable to all types of laundering. Some of these, especially APO [tris (1 - aziridinyl) phosphine oxide] and CBA [carbonyl bis-1-aziridine], produce "wash-and-wear" fabrics with over 300 degree (W+F) wrinkle recovery angles.

It has been found that durable creases can be put into fabrics already finished with epoxy and aziridinyl compounds by moistening with alkali solutions, then ironing in the creases at the desired locations. This method is also applicable to fabrics finished with N-methylol-type compounds and crosslinking compounds, such as 1,3-glycerol dichlorohydrin, and it even imparts durable creases to cotton fabrics which have had no prior finish.

MATERIALS AND METHODS

Except where specified, 3.3-oz 80x80 cotton print cloth was used for this study. It was desized, scoured, and peroxide bleached and in some cases slack mercerized. These fabrics are referred to as "unmercerized" and "mercerized" respectively, for convenience.

Several well - known wrinkle-resistant finishes were applied to fabrics for use in this study: dimethylol cyclic ethyleneurea (CEU), a modified urea-formaldehyde resin, a melamine-formaldehyde condensate, and an epoxy textile finishing agent. Newer finishing agents were also used: tris(1-aziridinyl)phosphine oxide (APO), carbonyl bis(1-aziridine) (CBA), tetrakis (hydroxymethyl) phosphonium chloride-methylolmelamine (THPC - methylolmelamine), and glycerol dichlorohydrin. APO is one of the components of a flame retardent (*7*) and is the compound recently reported as a "wash-and-wear" finish (*4*). CBA is also a new "wash-and-wear" finish, information concerning which is to be published soon (*3*). THPC-methylolmelamine refers to a flame-retardant finish which consists essentially of THPC and methylolmelamine, which copolymerize and react with cotton fabrics (*6*). This finish is intended primarily as a flame retardant; however, it is also used to some extent in England as a combination flame retardant and "wash-and-wear" finish. All of the above finishes were applied to print cloth except the THPC-methylolmelamine. It was put on a three-over-three cotton steep twill and on an eight-ounce viscose rayon fabric. The glycerol dicholorohydrin, which is a crosslinking agent for cotton, was applied according to a previously reported process (*8*).

* One of the laboratories of the Southern Utilization Research and Development Division, Agricultural Research Service, U S Department of Agriculture.

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In all other cases, application of the finish to the fabric consisted of padding through an aqueous solution of the finishing agent and an appropriate catalyst, drying the fabric at about 90° C, and curing at about 150° C. About 6% resin was put in the print cloth samples. The steep twill was treated to contain 23% add-on and the viscose rayon to contain 20%. The treated fabrics were washed thoroughly to remove unused chemicals and air dried.

Textile tests were performed under controlled conditions of 70°F and 65% relative humidity. Wrinkle recovery angles were determined by the Monsanto method (*1a*), and breaking strength was determined on the strip (*1b*). Creases were judged visually and rated as either excellent, good, poor, or no crease. A crease was rated excellent if it was sharp and quite pronounced; it was rated good if it was somewhat less pronounced; a rating of poor was given if there was definite evidence of a crease, even though it was rather flat.

EXPERIMENTAL AND DISCUSSION

Swelling with water followed by ironing has been used for centuries to crease household and apparel fabrics. In the present study some strong alkali solutions that are known to swell cotton to a considerable extent were investigated as a means of imparting durable creases. Sodium hydroxide being the best known and cheapest swelling agent for cotton (except water) was given the most attention. A quaternary ammonium hydroxide, trimethyl benzyl ammonium hydroxide, and cuprammonium hydroxide were studied sufficiently to demonstrate their effectiveness.

The method of evaluating the effectiveness of a particular alkali solution in aiding the formation of durable creases was as follows: the fabric to be durably creased was first given a temporary crease at the desired location by ironing; second, the fabric was moistened at the temporary crease by streaking with the alkali solution; and then the crease was ironed dry with a hot hand iron. Finally the fabric was rinsed to remove the alkali and line dried. The sharpness of the crease at this stage was judged qualitatively.

A number of alkali solutions were used on unmercerized print cloth (without a resin finish). In each case the alkaline solution contained about 0.2% of Tergitol Anionic 08 as a wetting agent.

It can be seen in Table I that 5% sodium hydroxide produced a poor crease, 15% of this alkali produced a good crease, and 20% and higher concentrations produced excellent creases. The quaternary ammonium hydroxide and the cuprammonium hydroxide in water solutions were somewhat less effective than the sodium hydroxide. It should be noted, however, that the molar concentration of these amines was much less than that of 15% sodium hydroxide. Ammonium hydroxide produced poor creases. Twenty-five percent potassium hydroxide solution was also used on some of the print cloth and on scoured and bleached 48 x 48 cotton sheeting and the creases were rated excellent in both cases.

TABLE I
Alkaline solutions for creasing cotton fabric

Alkali	*Concentration weight %*	*Appearance of crease*
Sodium hydroxide	5	poor
"	15	good
"	20	excellent
"	25	"
"	35	"
"	50	"
Potassium hydroxide	25	"
Ammonia	29	poor
Benzyl trimethyl ammonium hydroxide	28	good
Cuprammonium hydroxide	30 g Cu/l NH_4OH	"

Twenty-five percent sodium hydroxide solution was selected for experimental creasing of fabrics finished with various crosslinking agents and resin formers. In these experiments unmercerized print cloth finished with the following textile finishes were used: methylolmelamine, THPC-methylolmelamine, CEU, APO, CBA, Eponite 100, and glycerol dichlorohydrin. A sample of eight-ounce rayon containing THPC-methylolmelamine was also included in this study.

Here again, the fabrics to be creased were first given a temporary crease by ironing, then moistened at the crease with 25% sodium hydroxide solution and ironed dry at about 225° C. After a thorough rinse in hot water and drying, all of the fabric samples contained excellent creases. The creases remained sharp after five hours of rinsing in hot (85° C) alkaline (pH 9.5-10.0) tap water. An acid rinse had no visible effect on the creases. The process was repeated on two additional samples of fabric finished with APO and CBA. This time the processing was the same as before except the temperature of the iron was set on about 180° C to see if the ironing temperature was critical. In these cases, the creases were just as good as when the higher temperature of 225° C was used.

DURABILITY TO LAUNDERING OF CREASES PRODUCED WITH SODIUM HYDROXIDE——If the alkali-creasing method is to be of any real value, it must produce creases that are durable to laundering. To test the durability of creases imparted by 25% sodium hydroxide according to the technique described above, a number of creased fabrics were laundered ten times in an automatic home washer (agitator type) using Tide[1] as the detergent, and a chlorinated solid type bleach in the wash water. The small test samples, about six inches by six inches creased in both warp and fill directions, were placed in the washer along with other cotton goods to make up a normal load. The fabrics tested were unmercerized print cloth without a resin finish and the same cloth with the APO and CBA finishes. Another sample of the print cloth was mercerized before finishing with the APO. Steep twill (3/3) previously mercerized and finished with 23% THPC-methylolmelamine flame-retardant finish was also alkali creased and tested.

As shown in Table II, the creases produced by the alkali were all excellent before laundering and all remained excellent through the 10 launderings except the steep twill finished with THPC-methylolmelamine. It was rated good after laundering. Photographs of some of the laundered samples are shown in Figure 1, so that one can get a better idea of the quality and durability of the creases.

Creases imparted with the alkali can be removed, however, by remoistening the crease with 20-25% sodium hydroxide solution and pressing flat with the hot iron. This may be important in cases where the crease is first produced in the wrong position, or if it becomes desirable to remove the crease.

TIME NEEDED FOR ALKALI SOLUTION TO BE EFFECTIVE ——Swelling is an important prerequisite for durable crease formation. Swelling of cotton (not resin-treated) by mercerization strength caustic solutions proceeds quite rapidly. A moderate degree of mercerization can be obtained in about 20 seconds. However, one would expect crosslinked and resin-treated cotton to respond much slower. Mazzeno et al (5) recently found that it required about 20 minutes at 25° C for 20% sodium hydroxide solution

[1] The mention of trade names does not imply their endorsement by the Department of Agriculture over similar products not mentioned.

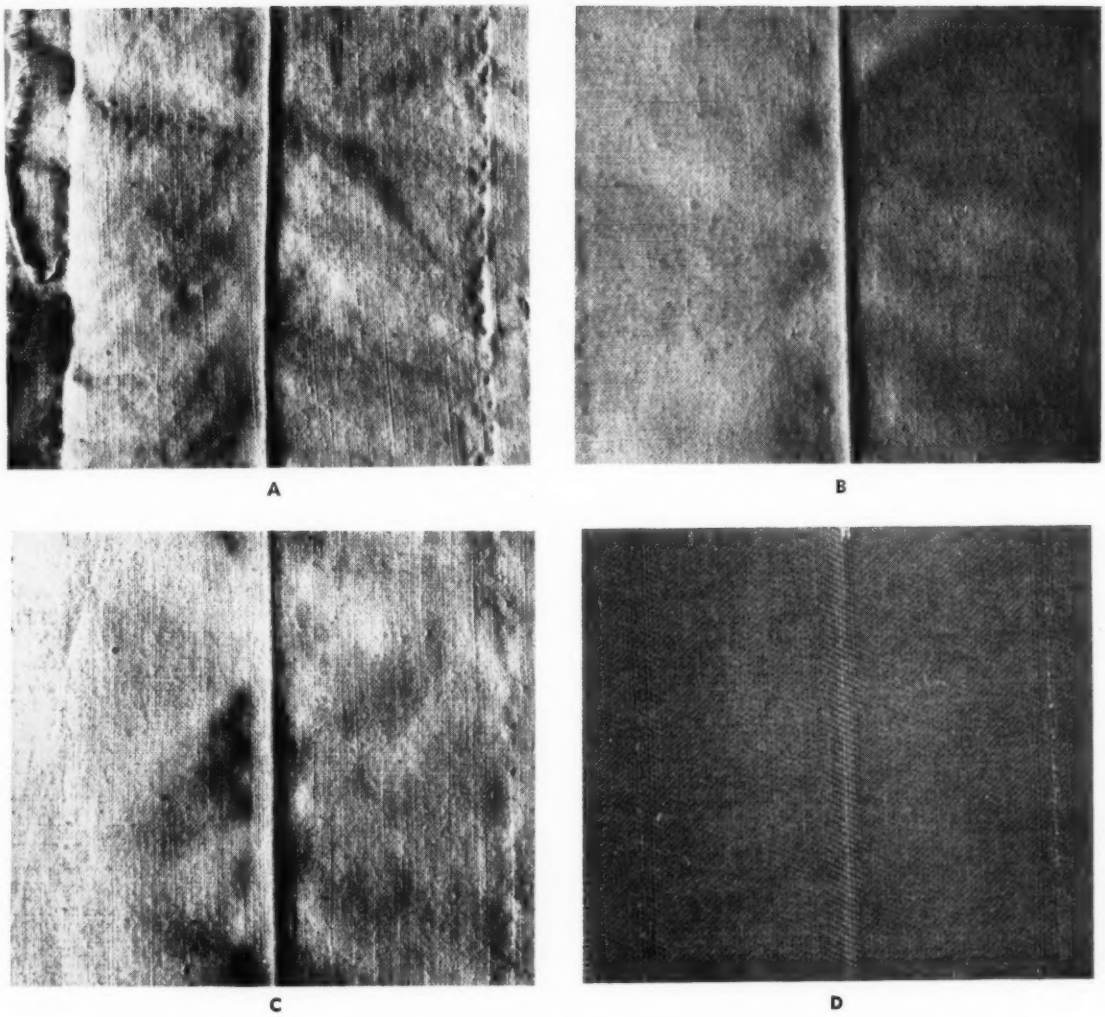

Figure 1
Alkali-creased fabrics after 10 launderings
A—Desized, scoured, and bleached print cloth without resin finish
B—Desized, scoured, and bleached print cloth with 6% CBA resin
C—Desized, scoured, and bleached print cloth with 6% APO
D—Desized, scoured, bleached, and vat dyed 3/3 steep twill with 23% THPC-methylolmelamine resin

to make appreciable changes in the tear strength of fabric finished with N-methylol type compounds.

The time needed for 25% sodium hydroxide to be in contact with a fabric containing about 6% of either CBA or APO finished to produce durable creases was determined. In this experiment a number of pieces of the resin-treated fabrics were given a temporary crease and moistened at the crease with 25% sodium hydroxide solution, then at definite intervals of time a piece was pressed with the hot iron set in the range of 200 to 250° C. The time the alkali solution remained in contact with the fabric before ironing ranged from one minute up to 20 minutes. The pressed, essentially dry fabrics were rinsed in water to remove the alkali then dried. The creases at this stage were all rated excellent. All the creased samples were washed about five hours in hot (80° C) running tap water and air dried. Qualitative an-

TABLE II
Durability of alkali-creased fabrics

Type of fabric	*Prefinish*	*Resin finish and % add-on*	*Quality of Crease Before laundering*	*After 10 launderings*
Print cloth	Desized, scoured and bleached	none	excellent*	excellent*
"	"	CBA (6.0%)	excellent	excellent
"	"	APO (6.0%)	excellent	excellent
"	Desized, scoured, bleached and mercerized	APO (6.0%)	excellent	excellent
3/3 steep twill	Desized, scoured, bleached and vat dyed	THPC-methylol-melamine (23%)	excellent	good

* This crease was excellent, but was puckered due to the shrinking caused by the alkali at the crease.

alysis showed that all creases remained sharp after the hot water wash and were rated excellent. One minute, the shortest time tested, in contact with the alkaline solution produced creases as good as when fabric was in contact with the alkali for 20 minutes before ironing.

EFFECTS OF HOT ALKALI ON STRENGTH AND WRINKLE RESISTANCE OF COTTON CLOTH———Since hot alkali is known to degrade cotton in the presence of oxygen, tests were run to determine the degree or extent of degradation as reflected by breaking strength that is caused by creasing according to the present method. To do this, samples of unmercerized print cloth about 12 inches by 12 inches were immersed in sodium hydroxide solution for two minutes, then run through squeeze rolls to remove excess solution and ironed dry without creasing with a hand iron set on "cotton" (about 225° C). The yellow alkali fabrics were then rinsed thoroughly and air dried. No attempt was made to maintain the original dimension of the fabrics during the alkali immersion step; therefore, the breaking strength measurements were made based upon specified thread count. For comparative purposes, one sample of the fabric was immersed in water for two minutes instead of sodium hydroxide solution and then carried through the remaining procedure. A sample of the original unmercerized fabric was used as the control.

In Table III, it can be seen that some of the hot alkali solutions definitely reduced the breaking strength. The loss was slight for 5% caustic, but significant for the 40 and 50% solutions. The 15 and 25% alkali solutions may have even increased the strength of the fabric, for the breaking strength values were 49 and 50 lbs, respectively, as compared to the control value of 47.9 lbs. It appears from these data that creasing with 15 to 25% alkali solutions does not weaken cotton fabric.

From visual observations of the various alkali-treated samples (without resin), it was apparent that some of the fabrics had slight "muss" or wrinkle resistance. Wrinkle-recovery tests made by the Monsanto method confirmed the observation. The wrinkle-recovery data in Table III show that the recovery angle increased as the alkali concentration increased. The 50% alkali produced fabric with an increase of dry wrinkle-recovery angle of approximately 19%, while an increase of over 40% was observed in the wet

TABLE III
Effect of hot alkali upon the strength and wrinkle resistance of cotton fabric cloth

NaOH Concentration %	*Breaking strength (warp)* lbs	*Increase in wrinkle-recovery angle (w+f) over untreated control fabric* %
Untreated control	47.9	—
Water only	46.4	8
5	43.7	9
15	49.0	12
25	50.0	13
35	45.3	14
40	41.4	17
50	36.0	19

wrinkle-recovery angle. No change in either wet or dry wrinkle-recovery angles was noted when this fabric was subjected to ten home-type laundry cycles.

An attempt was made to take advantage of the crease resistance obtained with the 25% sodium hydroxide solution by giving the hot-alkali treated fabric a post-resin treatment. Some of the alkali-treated fabric with a 13% increase in wrinkle-recovery angle was treated with dimethylol cyclic ethyleneurea. A piece of the original unmercerized fabric was also treated with the resin as control fabric. Both fabrics contained 6% resin add-on and the results showed that no significant benefit could be gained by using slack mercerized fabric for resin finishing, particularly when the mercerized fabric has been washed and allowed to dry prior to the resin treatment.

Another technique was also used to see if creasing with hot alkali solutions reduces the strength of fabric. In this case APO-finished fabric was creased with a hand iron, then the crease was moistened with 25% sodium hydroxide solution and ironed dry. After washing and drying, the fabric was cut into one-inch strips for breaking tests. The one-inch strips were cut so that the crease was perpendicular to the length of the strip. Five one-inch samples containing one crease per test specimen were tested. Examination of the fabric strips after they had been broken revealed that only one sample broke in the creased area. The other fourteen creases were at least as strong as the other areas of the strips. It appears from these data also that alkali creasing does not weaken cotton fabric.

NEED FOR PREMERCERIZATION———Slack mercerization of a cotton fabric causes shrinkage. When a narrow portion of a piece of fabric is slack mercerized, puckering occurs at the interface of the mercerized and unmercerized sections. The narrow mercerized area also becomes somewhat translucent, which is quite apparent visually. This is essentially what happens when unmercerized fabric is creased according to the procedure described above. Puckering and translucency are especially noticeable when unmercerized fabric is creased. Unmercerized fabric with a resin finish exhibits much less translucency and puckering than the fabric without resin, but these characteristics (translucency and puckering) are still often noticeable. When mercerized fabric, with or without a resin finish is used, both of the objections cited above are essentially eliminated.

Another technique of creasing which eliminated puckering was used. In this case the entire piece of goods was moistened with 25% sodium hydroxide solution, ironed only at the area where the creases were desired, and then rinsed to remove alkali. Although excellent creases were obtained, this technique is not recommended, because of the inconvenience of manipulating goods which are completely wet with a strong alkali solution.

BLEACHING OF DISCOLORED CREASED AREAS———Discoloration of white or light-colored fabrics often occurs near the crease when only the creased area is wet with the alkali solution. The exact cause for the discoloration is not known, but it is likely to be caused by a reaction of the hot alkali upon some impurities in the fabric. Discolorations have been noticed on nonresin-treated and resin-treated fabrics. Fortunately, the discoloration is easily removed by a perborate bleach. In every case of discoloration encountered in this study, a few minutes soak in hot (about 85° C) 0.5% sodium perborate solution removed the discoloration.

EFFECT OF HOT ALKALI ON THE COLOR OF SOME VAT-DYED SAMPLES OF COTTON PRINT CLOTH———The effect of the alkali-creasing technique on the color of four different samples of vat-dyed cotton fabric was determined. Mercerized print cloth was dyed a 10% shade with each of the following vat dyes: CI Vat Green 1 (CI 59825), CI Vat Orange 2 (CI 59705), CI Vat Blue 6 (CI 69825), and CI Vat Red 15 (CI 71100). Creases were put in the colored fabrics by moistening the area to be creased with 25% sodium hydroxide solution and ironing in the manner described above. The creased fabrics were washed with water and with perborate bleach. Of the four dyes tested, the CI Vat Red

(concluded on page 50)

DETECTION AND GEOGRAPHICAL ORIGIN OF IRON-SPOTTED RAW COTTON

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Brownish discoloration is common in commercial raw cotton and, in many years, results in the designation of a considerable fraction of the total crop by the nonspecific term "spotted". In the present work, commercial samples from across the U S Cotton Belt were examined and it was noted that many of them had brownish spots which did not bleach out in concentrated sodium hypochlorite solution. Such nonbleaching spots invariably contained more iron than the less-discolored parts of the same samples. Fiber with spots of this nature came particularly from the southeastern cotton-growing area of the United States, ie, from the Carolinas, Georgia, and Alabama. A few samples with such spots were noted also from the mid-south and the Texas-Oklahoma areas, but none to date from California or Arizona. Iron determinations showed a wide range of iron content in bleachable and white cottons but at a lower level than that found in the nonbleaching brown spots. A very simple hypochlorite test, here described, is believed to be a practical qualitative procedure for identification of high-iron spots in commercial raw cotton.

Several factors associated with bleachable spots in cotton are mentioned.

BACKGROUND

INDIVIDUALS concerned with cotton agree that an increased understanding of the use-value properties of the raw fiber and improved methods of evaluating such properties are urgently needed. In this connection, the writers have carried out a preliminary investigation of a brown-spotted condition in commercial cotton which has been found to be associated with a high iron content in the discolored fibers. The work reported herein relates to the geographical origin within the United States of raw cotton containing spots of high iron concentration and to a method of detecting such cotton.

From previous observations, several different situations which lead to discolorations in raw cotton are known. Microorganisms of various types may discolor the fiber by growth on it at the time of boll opening, during subsequent field exposure prior to harvest, or during humid storage of the seed cotton or the ginned lint; microbial discolorations may be of several colors, but they are most commonly gray and seldom rusty-brown. Brownish materials or their precursors may leach out of the cotton burr or bracts onto the fiber during weather exposure in the field prior to harvest, and the exudation of material from the seed onto the fiber with a resulting brown discoloration is also known. Further, a brown color in the fiber is sometimes associated with cold weather prior to the normal period of boll opening, sometimes with an immature seed phenomenon known as wither-tip, and at other times it results from insect attack on the bolls. Cotton with a high concentration of reducing substances is especially susceptible to the development of a yellowish color in storage (5), and Nickerson and coworkers have shown that the yellowing and darkening of stored cotton lint are related to the temperature and relative humidity of the storage spaces (7). The nonbleaching high-iron spots reported on here represent an additional and quite different type of discoloration from any of those mentioned above.

Block and Kwok (3) state:

> "The mineral constituents of raw materials and finished products in the textile industry are frequently of much significance in relation to the quality of finishing and dyeing. Traces of the salts of aluminum, copper, and iron in the dye baths are frequent offenders which cause undesirable changes in shade. The presence of metallic elements in water used for finishing often causes subtle differences in the finish of the fabric".

A 1958 report from the Southeastern Section, AATCC (1), on the effect of iron and copper on the degradation of cotton during peroxide bleaching, indicates that iron is not necessarily harmful to the cotton when in the ferric form. However, ferrous iron, as ferrous sulfate, had a markedly degradative effect even in very low concentrations. In some instances more damage resulted in the presence of very minute quantities of iron or copper than at intermediate or high levels. In fact, the metals appeared in some cases to protect the fiber from the peroxide, possibly by decomposing it before damage to the yarn could occur. The kinetics of the reaction between ferrous and ferric ions and hydrogen peroxide has been the subject of detailed examination by many workers since the early work of Mummery (6). An extensive bibliography on this matter is included in the Southeastern Section's 1958 report (1). The reaction is an exceedingly variable one, depending on the ratio of peroxide to metal, the relative concentrations of ferrous and ferric ions, and the presence or absence of other ions.

For purposes of orientation, it is pertinent to consider the level of iron in white, unspotted cotton in the absence of iron contamination from external sources. Heinzelman and O'Connor (4) made spectrographic analyses of fiber taken from mature but unopened bolls of several cotton varieties grown at Stoneville, Mississippi and of similar fiber from a single variety grown at 13 locations across the Cotton Belt. They found iron present in the fiber in the magnitude of four to 14 ppm. Our own colorimetric analyses of Deltapine double-haploid cotton from unopened bolls produced in our greenhouse shows substantially the same level, six to 12 ppm. Fiber from normally opened greenhouse bolls has been found to contain about 20 ppm and occasionally 30 or even 40 ppm.

MATERIALS AND METHODS

SAMPLES———Classers' samples of commercial raw cotton were obtained from the USDA Agricultural Marketing Service, Washington, DC.

BLEACHING———A small tuft of the spotted fiber was shaken in a test tube containing five ml of 5% NaOCl (undiluted commercial Clorox). After allowing 10 minutes for bleaching, the sample was observed to ascertain whether a rusty-brown color remained in the spot, and the result was

recorded as "bleached" or "not bleached". In cases where the sample appeared to have more than one type of spot, care was taken to test a number of each type.

IRON DETERMINATION——— One-gram samples of cotton fiber were ashed in a muffle furnace at 550°C as prescribed in the official method of the Association of Official Agricultural Chemists (2, p 100), a period of two hours being found sufficient to reduce the samples to a carbon-free ash. The ash was then dissolved in five ml of 1:1 HCl and diluted to 50 ml with distilled water and 25 ml was used for the colorimetric determinations. Samples were ashed in glazed porcelain crucibles previously washed successively in 1:1 HCl, 20% KSCN, and distilled water to remove iron contaminants. Two clean, glazed porcelain crucibles without fiber also were heated in the furnace along with the ashing samples to serve as controls to correct for any residual contamination.

The official colorimetric method of the AOAC (2) with o-phenanthroline was employed and was followed without deviation. After allowing one hour for complete color development, readings were taken at 500 mμ on a Klett-Summerson photoelectric colorimeter (Model 900-3). Distilled water was used as the comparison liquid. The slight contamination found in the blank crucibles and reagents was subtracted to give final values; contamination varied from four to seven ppm. All determinations were made against standards prepared in the same manner and read simultaneously with the ash solutions. The standard curve was found to follow Beer's Law.

The analyses were run on two one-gram portions for each sample, one consisting of spotted fiber and the other of fiber between the spots. Since it is impossible to completely separate discolored from nondiscolored fibers in a sample, the values for iron content of discolored spots represent only an approximation of the order of magnitude of the iron content in these areas.

RESULTS

Preliminary tests on a few isolated samples early in the course of this work showed that certain brown spots in commercial cotton resisted hypochlorite bleaching and that the same spots appeared to be high in iron content. A serious attempt was then made to check and extend these results. Bleaching tests were carried out on brown spots from cotton

TABLE I

Bleachability in 5% sodium hypochlorite of brown spots in samples of commercial cotton fiber and iron content of spots and of clear areas between spots in the same samples

Sample Description			*Iron content (ppm) of fibers in—*	
*Origin**	*Grade and year*	*Spots bleachable*	*Brown spots*	*Clear area*
Southeastern Area				
Atlanta, Ga	SLM sp,1957	no	421	161
	LM sp,1957	no	610	147
	SLM Ltsp,1957	no	286	45
Augusta, Ga	SLM sp,1957	no	321	168
	SLM sp,1957	yes	24	40
	LM Ltsp,1957	no	188	58
	SLM sp,1957	no	560	128
Birmingham, Ala	SLM Ltsp,1957	no	515	120
	SLM sp,1957	no	245	134
	M Tg,1957	yes	102	55
	SLM Tg,1957	no	240	226
Columbia, SC	SLM sp,1957	no	445	142
	SLM Ltsp,1957	no	152	27
	SLM sp,1957	no	270	97
	LM sp,1957	no	230	160
Montgomery, Ala	SLM Ltsp,1957	yes	68	50
	LM Ltsp,1957	yes	71	56
	SLM Ltsp,1958	yes	10	8
Raleigh, NC	SLM sp,1957	no	470	120
	SLM sp,1957	no	205	86
	SLM Ltsp,1957	no	258	124
Mid-South Area				
Alexandria, La	SLM sp,1957	no	826	19
	LM Tg,1957	no	606	274
	SLM Ltsp,1958	yes	36	29
Blytheville, Ark	SLM Ltsp,1957	yes	36	11
	SLM Tg,1957	yes	31	36
	SLM sp,1957	yes	179	150
Greenwood, Miss	SLM sp,1958	yes	156	187
	M Tg,1958	yes	28	24
	SLM sp,1957	yes	97	102
	SLM Tg,1957	yes	28	27
Hayti, Mo	SLM sp,1957	yes	98	47
	SLM Ltsp,1958	yes	63	70
	M Tg,1957	yes	43	57
Jackson, Miss	SLM sp,1957	yes	22	26
	SLM Ltsp,1957	yes	99	58
	LM Ltsp,1958	yes	22	24
	SLM Ltsp,1958	yes	43	22
Little Rock, Ark	SLM sp,1957	yes	35	35
	SM Ltsp,1958	yes	22	14
	SM sp,1958	yes	13	13
Memphis, Tenn	LM sp,1958	no	625	525
	M sp,1957	yes	90	86
	M Ltsp,1958	yes	24	25
Texas-Oklahoma Area				
Abilene, Tex	SLM sp,1957	yes	30	42
	SLM Ltsp,1957	yes	23	89
	LM sp,1958	yes	71	51
Altus, Okla	SLM sp,1957	yes	36	40
	LM Tg,1958	yes	20	23
	M Ltsp,1958	yes	32	14
Austin, Tex	SLM Ltsp,1958	yes	46	41
	SLM sp,1957	no	518	310
	SLM sp,1957	yes	88	29
	M sp,1957	no	316	124
Corpus Christi, Tex	SLM Ltsp,1957	yes	69	123
	SLM Ltsp,1957	yes	15	13
	M Ltsp,1958	yes	87	51
Dallas, Tex	LM sp,1958	yes	19	21
	M Yelsp,1957	yes	28	10
	SLM sp,1957	yes	151	54
Harlingen, Tex	SLM sp,1957	yes	22	22
	SLM Ltsp,1957	yes	39	27
	SLM sp,1957	yes	14	16
Lubbock, Tex	SLM sp,1957	yes	25	30
	M sp,1958	no	183	143
	SLM Ltsp,1957	yes	37	47
Oklahoma City, Okla	SLM sp,1957	yes	28	27
	SLM sp,1957	yes	53	60
	LM sp,1957	yes	28	27
Waco, Tex	SLM Ltsp,1957	yes	82	54
	M Ltsp,1958	yes	53	51
	SLM sp,1958	yes	102	81
	SLM sp,1958	yes	302	294

* USDA office in which sample was classed, which indicates general area of growth.

TABLE I (concluded)

Western Area				
Bakersfield, Cal	SLM sp.1957	yes	24	18
	SLM Ltsp.1957	yes	205	117
	M Ltsp.1958	yes	27	14
	SLM Ltsp.1958	yes	32	14
Carlsbad, NM	SLM Ltsp.1957	yes	26	25
	SLM sp.1957	yes	25	26
	SLM sp.1957	yes	27	32
El Centro, Cal	SLM sp.1957	yes	28	21
	SM Ltsp.1958	yes	3	12
El Paso, Tex	M Tg.1958	no	408	119
	SLM Ltsp.1957	yes	95	123
	SLM sp.1957	yes	22	34
	SLM sp.1957	yes	19	15
Fresno, Cal	SLM sp.1957	yes	23	27
	SLM sp.1957	yes	37	26
	SLM sp.1958	yes	29	13
Phoenix, Ariz	SLM Ltsp.1957	yes	68	34
	SLM sp.1957	yes	63	60

TABLE II

Geographical origin of commercial cotton samples with nonbleaching brown spots, crops of 1956-1958, inclusive

Origin	*Tested*	*Numbers of samples found with nonbleaching brown spots*	*Percent nonbleaching samples/area*
Southeastern Area			
Atlanta, Ga	26	24	
Augusta, Ga	12	10	
Birmingham, Ala	5	3	
Charlotte, NC	2	0	
Columbia, SC	4	4	
Raleigh, NC	6	4	82
Mid-South Area			
Alexandria, La	7	2	
Blytheville, Ark	4	0	
Greenwood, Miss	4	0	
Hayti, Mo	13	0	
Jackson, Miss	4	0	
Little Rock, Ark	11	0	
Memphis, Tenn	8	1	
Winnsboro, La	3	0	6
Texas-Oklahoma Area			
Abilene, Tex	18	0	
Altus, Okla	5	0	
Austin, Tex	12	3	
Corpus Christi, Tex	3	0	
Dallas, Tex	13	2	
Harlingen, Tex	5	0	
Lubbock, Tex	30	3	
Oklahoma City, Okla	40	12	
Waco, Tex	15	0	14
Western Area			
Bakersfield, Cal	5	0	
Carlsbad, NM	3	0	
El Centro, Cal	3	0	
El Paso, Tex	4	1	
Fresno, Cal	3	0	
Pecos, Tex	3	0	
Phoenix, Ariz	2	0	4

samples from classing offices throughout the cotton-growing region of the United States. Quantitative iron determinations were made on both brown spots and clear-fiber areas from the same samples. The objectives of the investigation were 1) to determine whether cotton with high-iron spots is characteristic of any particular geographical area or areas where cotton is produced in the United States, and 2) to test the practical utility of the hypochlorite procedure as a means of detecting high-iron spots in raw cotton.

The data of Table I show the frequent occurrence of cotton with spots of high-iron content—over 200 ppm—from the southeastern states. Cotton of this nature occurs at least occasionally in samples from classing offices in the mid-south, Texas-Oklahoma, and western areas, eg, from Alexandria, La, Memphis, Tenn, Austin, Tex, and El Paso, Tex.

From an inspection of Table I, it is apparent that the nonbleaching brown spots had a much higher iron content than the relatively less-discolored fiber in the same samples. No instance was found in which an unbleachable spot did not have a higher iron content than the whiter fiber of the same sample. Moreover, the cottons with bleachable spots were found to have consistently lower iron levels than those with nonbleaching spots. Table I shows that a wide range of iron concentrations occurs in commercial cotton and that this range is considerable even in samples which can be completely bleached. None of our data should, however, be construed to indicate that the iron level in cotton without visible brown spots may not be of such magnitude as to cause processing problems. The nonbleaching nature of the iron-containing spots would seem to represent a possible cause of discoloration in finished goods and to render such cotton of questionable desirability for certain types of materials.

Table II presents data obtained in an effort to establish more fully the geographical origin of cotton with high-iron spots; these results are from bleaching tests on samples in addition to those listed in Table I. In general, the data of Table II confirm those of Table I, indicating again the rather common occurrence of nonbleaching brown spots in cotton from the southeastern region of the United States. In the mid-south, such samples were noted again from Alexandria, La, and from Memphis, Tenn, and in the Texas-Oklahoma area from Austin, Tex, and Lubbock, Tex. In addition, nonbleaching spots were noted from Oklahoma City, Okla, and from Dallas, Tex. One sample out of four tested from El Paso, Tex again showed high-iron spots. It is by no means certain that, if additional samples had been examined from the mid-south and Texas-Oklahoma areas, additional locations might not have been noted as sources of cotton with high-iron spots. Conversely, it should be noted that not all brown-spotted samples from the southeastern states exhibited nonbleaching and high-iron characteristics in the discolored fibers.

DISCUSSION

The cause of high-iron spotting in cotton is not definitely known at present. The most logical supposition seems to be that it is the result of external contamination of the fiber with soil during preharvest exposure of the open bolls to the weather, but other possibilities have not been completely excluded.

The hypochlorite test—placing a small portion of the discolored cotton into 5% sodium hypochlorite and observing the color after 10 minutes—seems to be a simple, practical method for determining whether a visible brown spot in raw cotton is associated with a high-iron content in the spot. The official colorimetric method (2) is recommended where a quantitative micro-analysis is desired. A more rapid thiocyanate colorimetric method

has been successfully employed; it yields results comparable with those obtained by the official method under conditions of careful standardization and the usual precautions recommended for this procedure. The investigators have found that the problem of color fading inherent in the thiocyanate method can be avoided if colorimetric readings are made within five minutes after the addition of the thiocyanate reagent.

ACKNOWLEDGMENT

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Durable Creases—

(concluded from page 46)

15 was badly discolored in the creased area, the CI Vat Blue 6 was slightly discolored, and the other two dyes were essentially unaffected. Therefore, proper selection of dyes is necessary before this treatment can be used on colored fabrics.

SUMMARY AND CONCLUSIONS

A method of imparting durable creases into cotton and resin treated cottons has been developed. The method consists simply of ironing-in a crease in the presence of a strong sodium hydroxide solution. The fabric to be given a durable crease is first given a temporary crease by ironing in the crease at the desired location; second, the fabric is moistened at the temporary crease with a 20 to 25% sodium hydroxide solution; and then the crease is ironed dry with a conventional hand iron set at about 225° C. The fabric must be rinsed thoroughly to remove the alkali. Only mercerized and mercerized-resin-treated fabrics are well suited for the process. Unmercerized fabric usually leads to puckering and translucency at or near the crease. Discolorations which often occurred at or near creases due to the hot caustic can be removed by soaking the goods in hot 0.5% sodium perborate solution.

This method for creasing fabrics is applicable to cotton fabric (without resin) and to cotton fabrics containing many types of resin and cross-linking finishes. The durable crease is not dependent upon a cross-linking finish. Apparently swelling of the fibers is of prime importance. While in the swollen and thermoplastic state the hot iron fixes the fibers in a creased or flat condition. Creases imparted by the method have remained sharp and distinct through 10 home laundry cycles in which Tide was the detergent. Alkaline wash solutions did not remove the creases.

Durable creases imparted by alkali solutions and hot pressing should be an asset to a wide variety of cotton fabrics and especially to resin-finished "wash-and-use" household and wearing apparel which require creases in specific locations. The method should be useful for imparting durable pleats into skirts and the like. The technique presented herein for imparting durable creases was adequate for laboratory studies. Further research will be necessary to develop a suitable commercial technique utilizing the principle set forth here.

ACKNOWLEDGMENT

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General Calendar

AMERICAN ASSOCIATION FOR TEXTILE TECHNOLOGY, INC
Nov 4, Dec 2, Jan 6, Feb 3, Mar 2, Apr 6, May 4, June 1 (Della Robbia Room, Hotel Vanderbilt, New York, NY)

AMERICAN COTTON MANUFACTURERS INSTITUTE
April 7-9 (11th Annual Meeting Americana Hotel, Bal Harbour, Miami Beach, Fla); Mar 23-25 (12th Annual Meeting, Fontainebleau Hotel, Miami Beach, Fla)

AMERICAN SOCIETY FOR QUALITY CONTROL, TEXTILE DIVISION
Feb 18-19 (10th Annual Conference, Clemson House, Clemson, SC)

AMERICAN TEXTILE MACHINERY ASSOCIATION
May 23-27, 1960 (American Textile Machinery Exhibition, Auditorium, Atlantic City, NJ)

FEDERATION OF BRITISH INDUSTRIES
June 10-26 (British Exhibition of Industry, Technology, Science and Culture —Coliseum, New York, NY)

INTER-SOCIETY COLOR COUNCIL
April 11-12, 1960 (29th Annual Meeting—Philadelphia Museum College of Art, Philadelphia, Pa)

NATIONAL COTTON COUNCIL
Feb 8-9 (Annual Convention, Dallas, Texas); Sept 28-29 (9th Chemical Finishing Conference, Statler Hotel, Washington, DC)

PHI PSI FRATERNITY
April 28-30 (57th Annual Convention, Hotel Roosevelt, New York, NY)

SOUTHERN TEXTILE EXPOSITION
Oct 3-7, 1960 (Greenville, SC)

SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION OF THE UNITED STATES
Nov 4 (Luncheon meetings at the Hotel Roosevelt, New York, NY); Dec 2 (Annual meeting and dinner—Hotel Roosevelt, New York, NY)

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY, DELAWARE VALLEY SECTION
Mar 26 (3rd Philadelphia Conference of the Graphic Arts Industry—Benjamin Franklin Hotel, Philadelphia, Pa)

TEXTILE RESEARCH INSTITUTE
March 24-25, 1960 (30th Annual Meeting, Hotel Commodore, New York, NY)

Proceedings of the
American Association of Textile Chemists and Colorists

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October 19, 1959 No. 21

1959 Intersectional Contest—

DYEING WITH DIRECT DYES—THE EFFECT OF VARIOUS SALTS*

SOUTHEASTERN SECTION

INTRODUCTION

SALTS play a very important role in the application of direct dyes to cellulosic fibers. The rate and extent of exhaustion of direct dyes is regulated by controlled additions of salt to the dyebath during the dyeing operation. For economic reasons, sodium chloride or Glauber's salt are most commonly used.

From the theoretical point of view it has been suggested that electrolytes promote adsorption of direct dyes by a) increasing the activity of the dye in solution, b) facilitating adsorption of sodium ions (which must accompany the negatively charged dye ions into the fiber in order to maintain electrical neutrality), c) restraining the tendency of the sodium ions in the fiber to leave the cellulose and return to the dyebath, pulling dye ions with them and d) screening the negative charge at the surface of the cellulose, thereby reducing the force of repulsion between the fiber surface and the dye anions (*1*).

Some authorities believe that, in the complete absence of electrolytes, cellulose is incapable of adsorbing direct dyestuffs. However, there is evidence (*2*) that cellulose contains a limited number of sites, the nature of which is not known, for which direct dyes have a very high affinity and which will adsorb dyestuffs even in the absence of salts.

Various cellulosic fibers differ in their behavior toward direct dyes. One important reason for this difference is the carboxyl group content (formed by oxidative degradation of cellulose) of the various fibers. These ionize in water and thereby increase the negative surface charge; this in turn no doubt also determines the effect of salt on the dyestuff being used.

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This paper discusses the effect of salts other than sodium chloride and sodium sulfate on the dyeing behavior of direct dyes when applied to cotton cloth at a pH of 3. Dyeings with each of nine dyes were carried out for periods of one and five hours in the presence of each of six salts. The salts (chlorides of magnesium, calcium, barium, lead, aluminum and tin) were added to each dyebath at equivalent ionic strengths to facilitate comparisons. Reflectance data, obtained from the dyed samples with the aid of a spectrophotometer, were used to evaluate the effect of the salts; comparisons with dyeings made in the presence of sodium chloride were also made. The variability of the effect of any one salt on the dyes used in this work is very marked. Of the six salts used, aluminum chloride gave the poorest dyeings on the largest number of dyes. It is not possible, from this work, to make any general statements regarding the effect of salts on direct dyes. No correlations of the effect of the various ions with size, charge, or other physical characteristics have been possible. Apparently, the results are determined by both the nature of the dye and the added salt as well as other factors which have not yet been determined.

Individual dyes differ in their behavior toward salt. Several attempts have been made to express the effect of salt on various direct dyestuffs as a simple numerical value, but at present our knowledge of the subject is not sufficient to permit this to be done in a completely satisfactory manner.

The effect of salts other than sodium chloride or sodium sulfate on direct dyeing has been investigated to some extent. Most of this work has been summarized by Vickerstaff (*3*). This author states that the anions of various salts should have less effect on dyestuff adsorption than the nature and charge of the positively charged ions. This has been verified in some recent work by Chun (*4*) in which it was shown that the effect of equimolar quantities of the alkali metal halides on the exhaustion of a direct dye on cotton (after five hours of dyeing) varied indirectly with the size of the cations; ie, lithium, the largest ion, gave a dyebath exhaustion of about 52% while cesium, the smallest ion, exhausted the bath to the extent of about 65%. When these dyeings were repeated at an initial dyebath pH of 3, the values obtained were 60% for lithium chloride and 77% for cesium chloride. Potassium salts of the following anions gave the indicated exhaustion percentages when dyed for five hours with no pH control: SCN^- (57%), F^- (57%), Cl^- (58%), NO_3^- (58%) and Br^- (60%).

Sodium carbonate or disodium hydrogen phosphate are sometimes used in direct dyebaths to improve the solubility of certain direct dyes or to promote leveling and exhaustion.

The fact that the shade of many direct dyes is affected by certain metal ions is well known. Traces of the ions of aluminum, calcium, copper, iron, manganese or magnesium can change the shade of direct dyes (*5*). Of course metal ions are also used as aftertreatments to improve

* Presented October 9, 1959 at the Park Sheraton Hotel, Washington, DC, during the 38th National Convention.

the fastness properties of some direct dyeings.

It has also been shown than many direct dyes, which are unstable to temperatures above the boiling point of water (6, and references contained therein) and to prolonged boiling at atmospheric pressure (7), may be stabilized by the addition of appropriate salts. For example, Millson (7) has shown that a dyeing which, boiled for six hours, decomposed to give a color value only 58% of that obtained in a normal one-hour dyeing, gave a color value of 160% when boiled for six hours in the presence of 5% ammonium thiocyanate. This same salt was also found (7) to be effective in increasing the exhaustion of a dyestuff, the exhaustion of which increased with time of boiling. Using a normal one-hour dyeing as a standard (100%), this dye, boiled for one hour in the presence of ammonium thiocyanate, gave a color value of 160%; after boiling for six hours in the presence of 5% ammonium thiocyanate a value of 328% was obtained.

It is obvious, therefore, that the behavior of an individual direct dye depends upon many factors, among which are: the chemical nature of the dyestuff, the fiber being dyed (both its chemical and physical state as well as the nature of various impurities which may be present), the pH of the dyebath, the time and temperature of dyeing, the kind and amount of salt added (both by the dyestuff manufacturer for purposes of standardization and the dyer during the dyeing operation), as well as the method of adding the salt.

In an attempt further to determine the effect of salts on direct dyeing the experiments described below were carried out.

EXPERIMENTAL

Nine commercial direct dyes were each applied at a pH of 3, in the presence of one of six added salts (at equivalent ionic strengths) for periods of from one to five hours. The dyes selected for this work were chosen because metal ions were believed to have little or no effect on their shade and/or dyeing properties. The six salts used were all reagent grade chlorides. The four divalent cations used differed in size; one chloride with a trivalent cation and one with a quadrivalent cation were also used. Information regarding the salts is summarized in Table I. Information about the dyestuffs used is given in Table II; formulas for the dyes are included as Figure 9.

For each dyeing, scoured and bleached cotton print cloth (80 square; 5.0 g) was dyed in a 40:1 bath (200 ml) containing 1% owf (0.05 g) dye and added salt at the concentration given in Table I, at an intial pH of 3 adjusted with HCl. The cloth was placed in the prepared dyebath at room temperature, heated to the boil during 15 minutes, and dyed at the boil for one or five hours. Water lost by evaporation was replaced. The dyed samples were removed from the dyebath, rinsed thoroughly in warm water, dried, and pressed between samples of white cloth. Dyes 1, 4, and 7 were dyed for five hours; one-hour and five-hour dyeings were made with the other dyestuffs.

Attempts were made to determine the light-absorption characteristics of samples of the original as well as of the exhausted dyebaths. This was

TABLE I
Salts

Name	*Formula*	*Formula weight*	*Moles per liter*	*Relative size of hydrated cation*
Magnesium chloride	$MgCl_2.6H_2O$	203	0.0033*	8
Calcium chloride	$CaCl_2$	111	0.0033*	6
Barium chloride	$BaCl_2.2H_2O$	244	0.0033	5
Lead chloride	$PbCl_2$	278	0.0033	4.5
Aluminum chloride	$AlCl_3.6H_2O$	241	0.00167*	9
Tin chloride	$SnCl_4.5H_2O$	351	0.00074**	11

* These values give an ionic strength equivalent to 0.01 molar NaCl
** The concentaration of this salt was equivalent to 0.0074 molar NaCl

TABLE II
Wavelengths used and reflectance values of standard dyeings

Dye No.	*Colour Index Designation*	*CI No.*	*Wavelength (millimicrons)*	*Reflectance values for one-hour dyeings with 0.01 M NaCl*	
				no pH control	*initial pH 3*
1	Direct Yellow 12	24895	410	—	1.000
2	Direct Yellow 50	29025	430	0.970	1.024
3	Direct Yellow 29	19556	400	1.091	1.181
4	Direct Red 4	29165	500	—	1.237
5	Direct Red 2	23500	520	1.302	1.260
6	Direct Red 37	22240	500	1.058	1.125
7	Direct Green 6	30295	630	—	1.276
8	Direct Blue 71	34140	600	1.187	1.143
9	Direct Blue 78	34200	600	1.112	1.149

TABLE III
Reflectance and pH values for five-hour dyeings in the presence of 0.01 M NaCl

Dyestuff	*No pH control* — *pH* — *Initial*	*Final*	*Reflectance*	*%**	*Initial pH 3* — *Reflectance*	*%**
CI Direct Yellow 50	7.5	6.6	0.905	93	0.948	98
" " Yellow 29	9.1	7.1	1.113	102	1,136	104
" " Red 2	6.9	6.6	1.203	92	1.212	93
" " Red 37	5.7	5.8	1.067	101	1.158	109
" " Blue 71	8.3	6.6	1.102	92	1.151	97
" " Blue 78	6.6	6.6	1.141	102	1.132	102

* Comparision with standard one-hour dyeing (0.01 M NaCl, no pH control). See Figure 1.

TABLE IV
Reflectance values and percentages for five-hour dyeings in the presence of various salts at an initial pH of 3

Salt	*CI Direct Yellow 12* — *Reflectance*	*%**	*CI Direct Red 4* — *Reflectance*	*%**	*CI Direct Green 6* — *Reflectance*	*%**
$MgCl_2$	1.000	100	1.284	104	1.161	91
$CaCl_2$	0.881	88	1.257	102	1.301	102
$BaCl_2$	0.748	75**	1.175	95	1.093	86**
$PbCl_2$	0.722	72	1.122	91	1.044	82
$AlCl_3$	0.733	73**	1.112	90	0.737	58**
$SnCl_4$	1.000	100	1.121	91	1.180	93

* Compared with standard one-hour dyeing, initial pH of 3, with 0.01 M NaCl
** Visible shade change

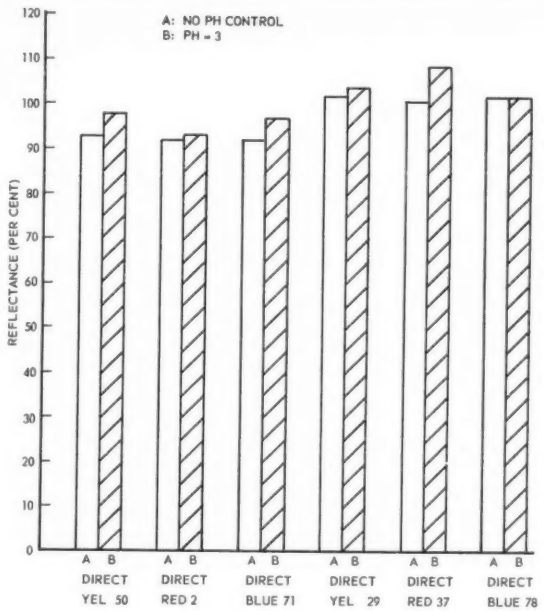


Figure 1
Effect of dyeing conditions on behavior of direct dyestuffs

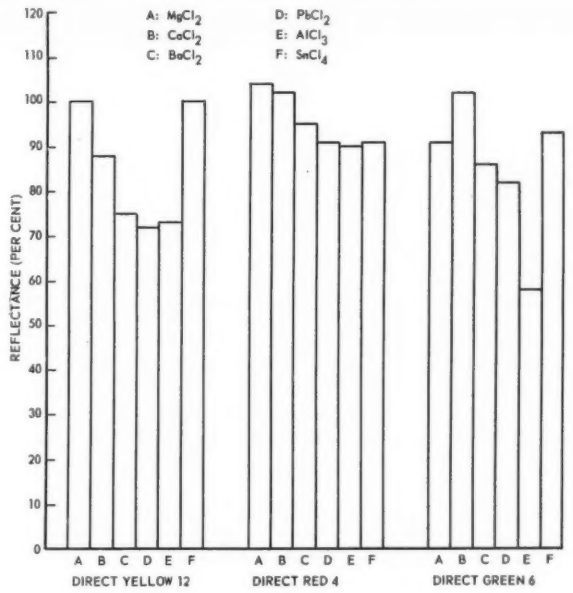


Figure 2
Effect of inorganic salts on CI Direct Yellow 12, CI Direct Red 4 and CI Direct Green 6 (pH = 3)

found to be impractical because of apparent dyestuff decomposition and the separation of insoluble substances from the samples.

The light reflectance of each dyed sample was determined with the aid of a Beckman Model DU Spectrophotometer equipped with a photomultiplier attachment. A magnesium carbonate block was used as a reference standard. The reflectance values (read from the absorbancy scale) obtained for each sample (versus the magnesium carbonate block) were compared with those obtained from a standard one-hour dyeing in the presence of 0.01 moles per liter of sodium chloride either with no pH control or in a dyebath the initial pH of which was adjusted to 3 with HCl. The wavelengths at which the reflectance values for each dye were measured, and the data for the standard dyeings, with and without pH control, are given in Table II.

Table III gives data for six of the dyes, each dyed for five hours in the presence of 0.01 M NaCl either at an initial pH of 3 or in an uncontrolled dyebath. These data are reported as percentages of those obtained from one-hour dyeings with 0.01 M NaCl but without pH control, and are plotted in Figure 1.

Table IV gives data obtained when three of the dyes (Nos. 1, 4, and 7) were dyed for five hours at an initial pH of 3 in the presence of each of the six salts. The results are calculated as percentages of standard one-hour dyeings begun at a pH of 3 in the presence of 0.01 M NaCl, and are plotted in Figure 2.

The data and percentages obtained with dyes 2, 3, 5, 6, 8, and 9 are given in Table V and plotted in Figures 3 through 8.

TABLE V
Reflectance readings and percentages calculated vs one-hour dyeing at initial pH 3

	CI Direct Yellow 50	*CI Direct Red 2*	*CI Direct Blue 71*	*CI Direct Yellow 29*	*CI Direct Red 37*	*CI Direct Blue 78*
$MgCl_2$						
One-hour dyeing Reflectance	0.927	1.026	0.735*	0.940	1.069	1.039
%	90	81	64	80	95	90
Five-hour dyeing Reflectance	0.844	1.055	0.778	1.000	1.117	0.950
%	82	84	68	85	99	83
$CaCl_2$						
One-hour dyeing Reflectance	1.012	1.375	0.655	1.103	0.960	1.001
%	98	109	57	93	85	87
Five-hour dyeing Reflectance	0.919	1.339	0.479*	1.144	0.732	0.870*
%	90	106	42	97	65	76
$BaCl_2$						
One-hour dyeing Reflectance	0.950	1.293	1.049	1.020	1.098	1.092
%	92	103	92	86	97	95
Five-hour dyeing Reflectance	0.860	1.288	1.087	0.990	1.110	0.970
%	84	102	95	84	98	84
$PbCl_2$						
One-hour dyeing Reflectance	0.942	1.031	1.013	0.938	1.054	1.132
%	92	82	88	79	94	98
Five-hour dyeing Reflectance	0.890	0.438*	1.026	1.014	1.012	1.137
%	87	35	90	85	90	99
$AlCl_3$						
One-hour dyeing Reflectance	0.903	0.642*	0.329	0.838	0.860	0.923
%	88	51	29	71	76	80
Five-hour dyeing Reflectance	0.879	0.674*	0.668*	0.850*	0.899	0.923
%	86	54	53	72	80	80
$SnCl_4$						
One-hour dyeing Reflectance	0.765	1.181	1.057	1.019	1.078	1.010
%	75	94	92	86	96	87
Five-hour dyeing Reflectance	0.704	1.186	1.125	1.041	1.083	1.026
%	69	94	98	88	96	90

* Shade changed

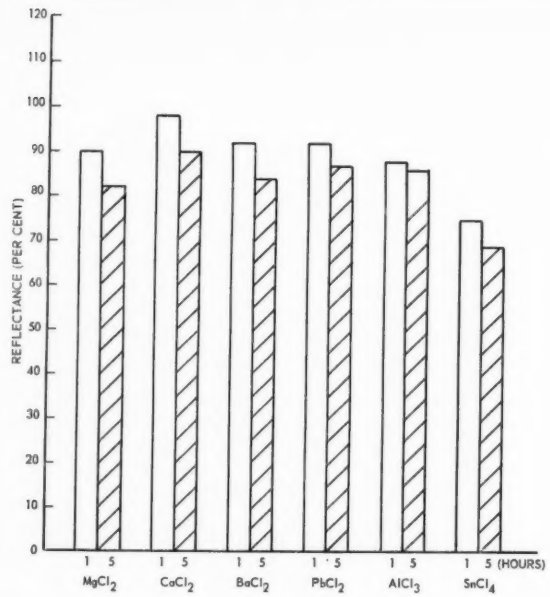


Figure 3
Effect of inorganic salts on CI Direct Yellow 50 (pH = 3)

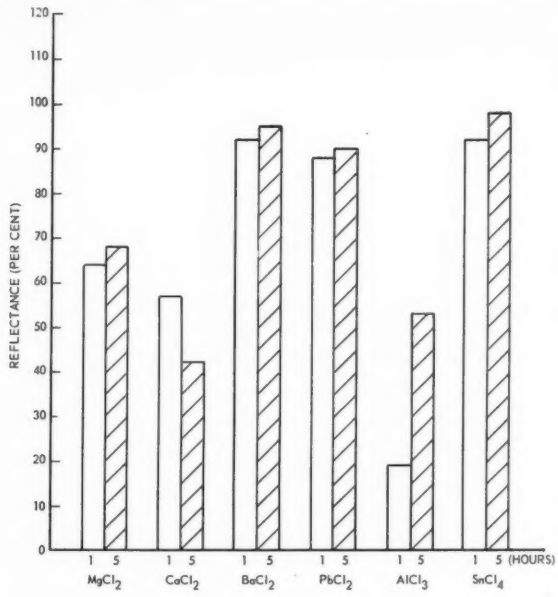


Figure 5
Effect of inorganic salts on CI Direct Blue 71 (pH = 3)

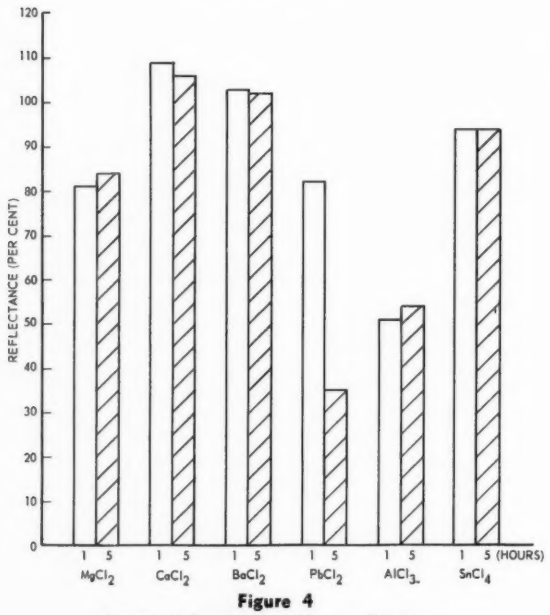


Figure 4
Effect of inorganic salts on CI Direct Red 2 (pH = 3)

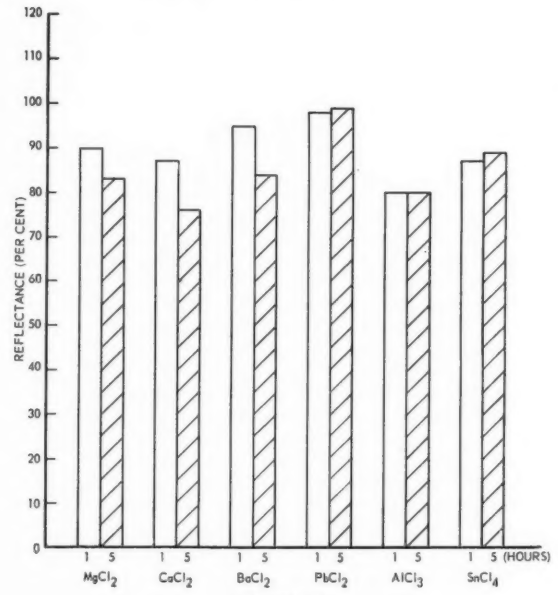


Figure 6
Effect of inorganic salts on CI Direct Yellow 29 (pH = 3)

RESULTS AND DISCUSSION

Figure 1 shows the effect of dyeing at a pH considerably lower than that normally used in commercial practice. With five of the six dyes examined, the lower pH resulted in an increase in dyebath exhaustion. This is caused, to a large extent, by a lowering of the negative surface potential of cellulose (*9*). The presence of acid suppresses the ionization of carboxyl groups in cellulose and thereby decreases, to some extent, the negative charge at the surface of the fiber.

The data plotted in Figures 2 through 8 show the effectiveness of the salts used, compared with sodium chloride at the same pH. It must be emphasized that the salt content of each dyebath was not known because commercial dyes were used. However, for any one dye, a comparison of the effect of the added salts is valid because the total salt content (salt added as an inert diluent by the manufacturer as well as salt added in this work) of each bath was the same. All of the dyebaths prepared with any one dye contained the following anions: chloride ions from

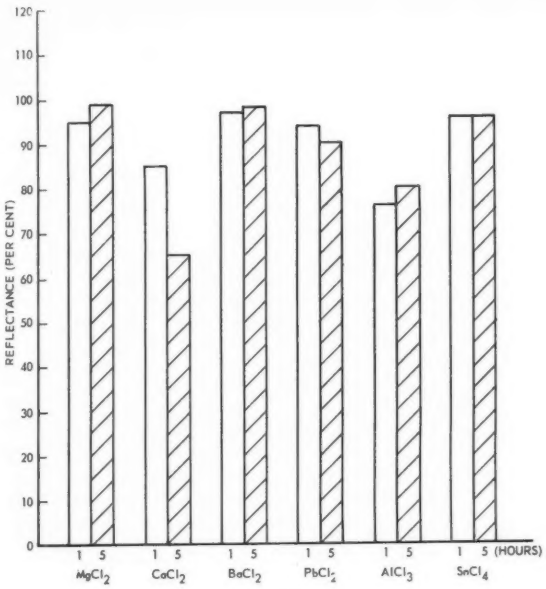


Figure 7
Effect of inorganic salts on CI Direct Red 37 (pH =3)

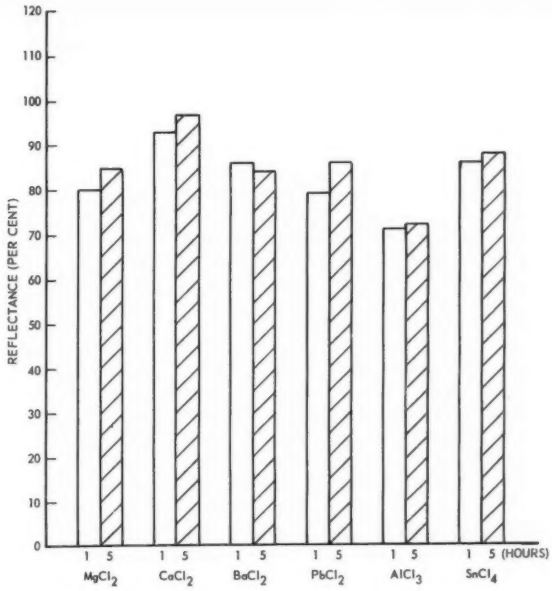
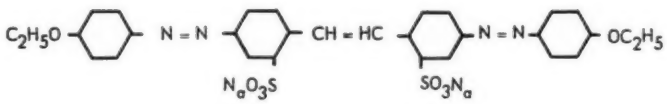
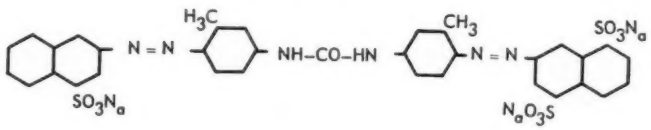


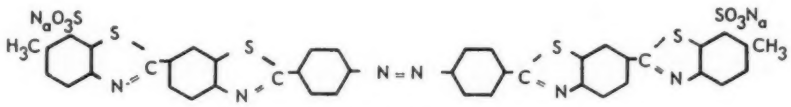
Figure 8
Effect of inorganic salts on CI Direct Blue 78 (pH = 3)



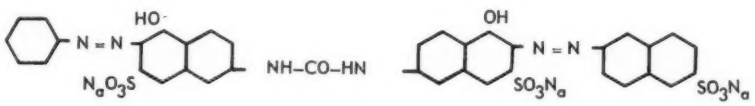
CI Direct Yellow 12



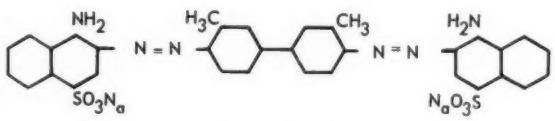
CI Direct Yellow 50



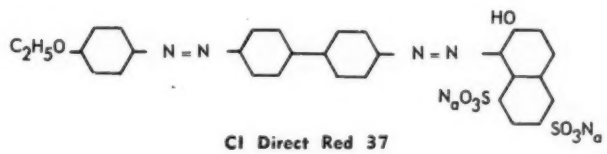
CI Direct Yellow 29



CI Direct Red 4

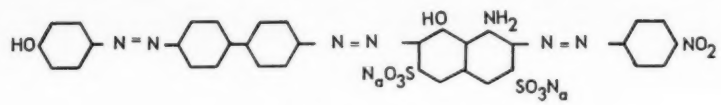


CI Direct Red 2

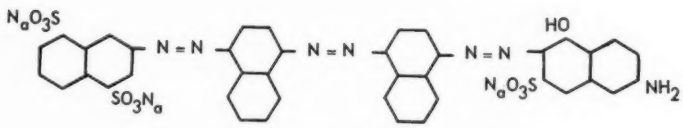


CI Direct Red 37

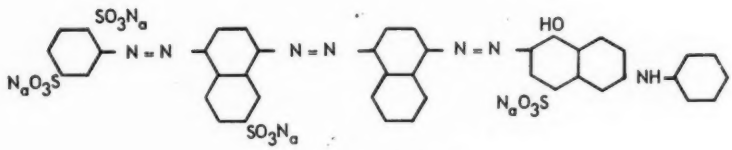
Figure 9a
Dye structures



CI Direct Green 6



CI Direct Blue 71



CI Direct Blue 78

Figure 9b
Dye Structures

the HCl and added salt, dye anions, and anions of the salt used by the manufacturer as a diluent. In addition, these baths contained positive ions from the dye and diluent salt (usually sodium ions), and positive ions from the added salt. The ions added as dye and diluent salt were of course the same for one dye; because the added salts were used at equal ionic strengths (except for the tin salt) each bath, with any one dye, contained the same concentration of ions, and differed only in the nature of the added cation.

The effects of the six added salts on three of the dyes are shown in Figure 2. The barium and lead chlorides were detrimental to CI Direct Yellow 12 dyeings. Aluminum chloride adversely affected both CI Direct Yellow 12 and CI Direct Green 6. None of the salts showed a marked effect on CI Direct Red 4.

Figure 3 shows that none of the ions was as effective as sodium in exhausting the CI Direct Yellow 50 dyebath. The results with tin chloride were significantly lower than those obtained with common salt.

The results with CI Direct Red 2 (Figure 4) were more variable. Calcium chloride and barium chloride gave exhaustions equal to or slightly better than sodium chloride. The lead and aluminum salts, however, gave only very weak dyeings.

CI Direct Blue 71 (Figure 5) was apparently partially destroyed by the calcium and aluminum ions, as evidenced by the marked shade change in the five-hour dyeings. In addition, the cloth dyed in the presence of calcium chloride was markedly tendered. Some tendering is of course to be expected when dyeing cotton for five hours at a pH of 3 in the presence of HCl. However, it has been reported (*10*) that the smallest concentration of HCl in which cotton may be boiled for one hour and show a change in copper number and a reduction in tensile strength is 0.0007 N or a pH in the vicinity of 3. It is therefore believed that the severe tendering observed with CI Direct Blue 71 in the presence of calcium chloride was due, in major part, to factors other than the pH of the dyebath.

Calcium chloride also gave very poor exhaustion (compared with sodium chloride) of CI Direct Red 37 (Figure 7) and CI Direct Blue 78 (Figure 8). In these cases the marked shade change observed with CI Direct Blue 71 was not noted.

The variability of the effect of any one salt on the dyes used in this work is very marked. Magnesium chloride was similar in its action to sodium chloride except in the case of CI Direct Blue 71. Calcium chloride gave dyebath exhaustions equal to or better than those obtained with sodium chloride with five of the dyes (CI Direct Red 4, Green 6, Yellow 50, Red 2, Yellow 29) but apparently destroyed CI Direct Blue 71. The barium salt gave significantly poor results only with CI Direct Yellow 12. Lead chloride affected CI Direct Red 2 and CI Direct Yellow 12 adversely but had no marked effect on the other dyestuffs. Of the six salts used aluminum chloride gave the poorest dyeings on the largest number of dyes. Tetravalent tin ions gave dyeings significantly lower than those obtained with common salt only in the case of CI Direct Yellow 50.

It is not possible, from this work, to make any general statements regarding the effects of salts on direct dyes. No correlations of the effect of the various ions with size, charge, or other physical characteristics have been possible. Apparently the results are determined by both the nature of the dye and the added salt as well as by other factors which have not been determined.

ACKNOWLEDGMENT

The Committee wishes to thank the personnel of the cooperating organizations who performed the dyeings; and especially Chung Sun Suh, who performed all of the spectrophotometric analyses.

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(*2*) Ibid, p 233.
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1959 Intersectional Contest———

"WASH-AND-WEAR" RATINGS: SUBJECTIVE AND OBJECTIVE*

WASHINGTON SECTION

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Various subjective methods for evaluating the "wash - and - wear" properties of a range of fabrics are compared with each other and with an optical, objective method. The correlation was found between the objective and subjective methods. The subjective methods all showed wide variations between raters, while the objective method exhibited excellent reproducibility. Such an objective method appears to be suited for comparison of various "wash-and-wear" treatments on one fabric, for quality control in textile finishing, as well as for comparison of fabrics differing in color construction, fiber content, and luster.

INTRODUCTION

WITH the phenomenal increase in the production of "wash-and-wear" fabrics, the need for a good method for measuring the degree of wrinkling of a fabric has become very important. At present, a garment or swatch is washed and dried under any of several standard conditions, and viewed under certain lighting conditions by a panel of raters. The raters compare the sample with a set of photographic standards (showing fabrics with varying degrees of wrinkling) and assign it a numerical rating, usually on a scale of "5" (best appearance) to "1" (worst appearance). Several methods of lighting and several sets of photographic standards have been developed, one of which has been adopted by the AATCC as Tentative Test Method 88-1958 (*1*).

In general, the present methods serve their purpose reasonably well. However, like all subjective ratings, they are plagued by large variations between the ratings by the individual members of a panel, day-to-day variations of any one panel, and variations between various panels. In addition, subjective ratings are time consuming. Other difficulties include the effect of a few large creases versus many small creases, and the effect of color, pattern, fabric texture, and luster. Even with these deficiencies, the present subjective methods are probably more precise than the judgment of garments by consumers.

The ideal solution, however, would be an objective rating performed by one operator which would produce a simple numerical result. Several wrinkle-analysis instruments have been suggested for this purpose. Hebeler and Kolb (*2*) described a mechanical instrument years before "wash-and-wear" was in vogue. At a recent AATCC meeting, Hunter (*3*) described an instrument, called the "Wrinklemeter", designed to rate "wash-and-wear" by means of the reflectance of fabrics. Other possibilities for such instruments are presented by scanning circuits of the type used in television, and other optical and tactile recording methods.

In view of the number of subjective methods presently used for the rating of "wash-and-wear" appearance, and the availability of an experimental model of the Wrinklemeter to the Washington Section of AATCC, this study was undertaken to obtain a comparison of these various methods by answering the following questions:

1) How do various subjective methods of "wash-and-wear" evaluation, ie, those using various photographic standards and lighting conditions, correlate with each other?

2) Are the ratings of some methods more reproducible[1] than others?

3) How do subjective evaluations of photographs of fabrics compare with the ratings of actual fabrics?

4) Can verbal descriptions, eg, "5" (smooth), "4" (very slightly wrinkled), etc, be substituted for photographic standards?

5) How do the various subjective methods correlate with the objective Wrinklemeter results?

6) How are all the various rating methods affected by the use of fabrics differing in color, pattern, texture, and luster?

MATERIALS AND METHODS

MATERIALS———The materials were chosen with two aspects of the problem of "wash-and-wear" evaluation in mind. The first series were samples of 150 x 60 white cotton broadcloth fabric which had been resin treated at various concentrations, representing one fabric type with various degrees of wrinkling after laundering. This should provide results of interest to those concerned with evaluating different "wash-and-wear" resins. The second series was chosen to include several aspects of "wash-and-wear" evaluation. These were fabrics which varied in color, texture, luster, and fiber content. A description of the fabrics in both series is presented in Table I.

SUBJECTIVE RATING METHODS———The fabrics were rated for the degree of wrinkling using five different subjective techniques. Some of these are standard techniques, while others are variations of standard techniques. All ratings were made to the nearest quarter unit on a "wash-and-wear" scale of "1" through "5". The following subjective methods were employed:

1) *AATCC Method (AATCC Tentative Test Method 88-1958)(1).* This method involved the illumination of the fabric at a very low angle ("Cranston Box"), so that the wrinkles in the fabric are accentuated. The fabrics to be rated were compared to photographic standards and given a rating of "1" (very wrinkled) to "5" (quite smooth).

* Presented October 9, 1959 at the Sheraton Park Hotel, Washington, DC, during the 38th Annual Convention

[1] As an expression of reproducibility, the 95% confidence limits were used in this paper. A small confidence limit indicates a more reproducible, ie, less variable, method of "wash-and-wear" evaluation than a large one.

2) *DuPont Method.* This method involved the illumination of the fabric with the light source at a 20° angle to the plane of the fabric. The samples were rated against a series of photographic standards shown in the DuPont Technical Information Bulletin X-83.
3) *Photographic Method.* This method involved the use of the DuPont lighting source; however, the samples were photographed and the photographs then compared against the DuPont photographic standards. A Polaroid camera was employed in this work, because it makes a finished picture available within several minutes. To minimize the effect of color, the exposure time was varied so that the same depth of shade of the photographs was obtained for samples varying in color.
4) *Eastman Method.* This method involved the use of the DuPont lighting conditions and the photographic standards supplied by Eastman Chemical Products, Inc.
5) *Verbal Method.* This method utilized the DuPont lighting conditions with no photographic standards. However, the following verbal standards were used by the raters:
   5—Smooth
   4—Very Slightly Wrinkled
   3—Slightly Wrinkled
   2—Wrinkled
   1—Very Wrinkled

PANEL COMPOSITION———The fabrics of the first series (white cotton fabrics treated with various resin concentrations) were judged by a panel of 12 raters. Nine of these individuals had some experience in "wash-and-wear" evaluation, while three had never rated "wash-and-wear" before, but were chosen to represent the intelligent, interested buying public. Triplicates of the fabrics of the second series, fabrics varying in color and construction, were rated only by one three-member panel, as is the standard AATCC practice.

OBJECTIVE RATING———The fabrics were rated using an objective optical device designed to measure the degree of wrinkling by measuring the light reflection of fabrics. This instrument was a modified version of the Wrinklemeter which has been previously described by Hunter (3). The fabric was illuminated by a light source at an angle 18° to the plane of the fabric. The reflectance of the fabric was measured by two photoelectric cells at an angle of 5° to the plane of the fabric, one being adjacent to and the other opposite the light source. The instrument was adjusted to read 500 when a piece of a standard white filter paper was used in place of the fabric sample. Readings were made with the fabric illuminated on the bias; the actual reading was subtracted from 1000 in order to give higher numbers to smoother fabrics. For the comparison of fabrics which varied in color, texture, fiber content, resin treatment, and luster, the ratio of the reflectance of the wrinkles to that of the ironed fabric was employed:

$$\frac{1000\text{—wrinkled sample reading}}{1000\text{—ironed sample reading}} \times 100 = \text{Wrinklemeter ratio}$$

TABLE I

Fabric No.	*Fiber*	*Color*	*Weave*	*Texture*
		First series		
1-15	cotton	white	plain	160 x 60
		Second series		
16	cotton	white	basket	96 x 96
17	cotton	white	plain	88 x 80
18	cotton	tan	plain	88 x 80
19	cotton	red	plain	88 x 80
20	cotton	brown, red, yellow, and white print	plain	88 x 80
21	cotton Dacron	white	plain	142 x 72
22	polished cotton	white	plain	88 x 60
23	cotton	white	plain	140 x 64
24	nylon filament	white	plain	116 x 72
25	cotton	white	petit point	128 x 56
26	cotton	white	corduroy	70 x 100

TABLE II

Comparison between various subjective and objective method for rating the degree of wrinkling of white fabrics varying only in resin treatment

	Subjective Methods—Average Ratings					*Objective Method Wrinklemeter*	
Fabric No.	*AATCC*	*DuPont*	*Photographic*	*Eastman*	*Verbal*	*Rating*	*Ratio*[a]
1	3.6	2.8	3.1	4.3	4.2	494	101
2	3.7	2.8	2.6	4.0	4.1	477	98
3	3.6	2.5	2.8	3.9	3.8	499	103
4	4.2	2.6	2.6	3.6	3.6	436	90
5	3.8	2.6	2.2	3.5	3.7	467	96
6	3.9	2.7	2.6	3.8	3.9	467	96
7	3.3	1.8	1.9	2.9	2.9	457	94
8	3.0	1.5	1.9	2.9	2.5	449	92
9	3.8	2.1	2.1	3.3	3.1	433	89
10	3.1	1.5	1.7	2.8	3.4	434	89
11	3.1	1.7	1.8	2.8	2.9	399	82
12	2.8	1.4	1.4	2.5	2.4	404	83
13	1.8	1.1	1.2	2.2	1.8	402	83
14	2.2	1.2	1.2	2.3	2.1	401	83
15	2.0	1.2	1.2	2.1	1.4	391	80

[a]Ironed fabric = 486

TABLE III

Comparison between various subjective and an objective method for rating the degree of wrinkling of fabrics varying in color, texture, luster, and fiber content

	Subjective Methods—Average Ratings					*Objective Method Wrinklemeter*		
Fabric No.	*AATCC*	*DuPont*	*Photographic*	*Eastmon*	*Verbal*	*Average Rating Wrinkled*	*Ironed*	*Ratio*
16	3.8	2.1	2.3	3.1	3.0	446	525	85
17	2.1	1.2	1.3	2.2	2.1	332	403	82
18	3.6	1.4	1.3	2.4	2.4	556	688	81
19	4.4	2.6	2.1	3.3	3.3	—	—	—
20	3.7	4.0	4.1	4.6	3.6	—	—	—
21	4.4	3.4	3.1	3.9	3.6	376	510	72
22	4.0	1.2	1.7	2.5	2.2	475	607	78
23	2.0	1.1	1.1	2.2	1.4	389	463	84
24	3.2	2.0	2.4	3.2	2.7	604	662	92
25	4.2	2.2	2.2	3.0	2.9	289	329	87
26	2.5	1.6	1.4	2.3	1.9	151	175	86

RESULTS AND DISCUSSION

COMPARISON OF VARIOUS SUBJECTIVE "WASH-AND-WEAR" RATING METHODS——It was found that the various methods of evaluating "wash-and-wear" appearance were affected differently by color and construction of the fabrics. For this reason, the data for the white cotton fabrics differing only in the resin treatment, ie, the degree of wrinkling, and the data for the group of fabrics differing in color and construction are treated separately below. In Tables II and III, showing data for the two fabric groups, the average ratings are shown for each fabric. In the figures, the average ratings obtained by the

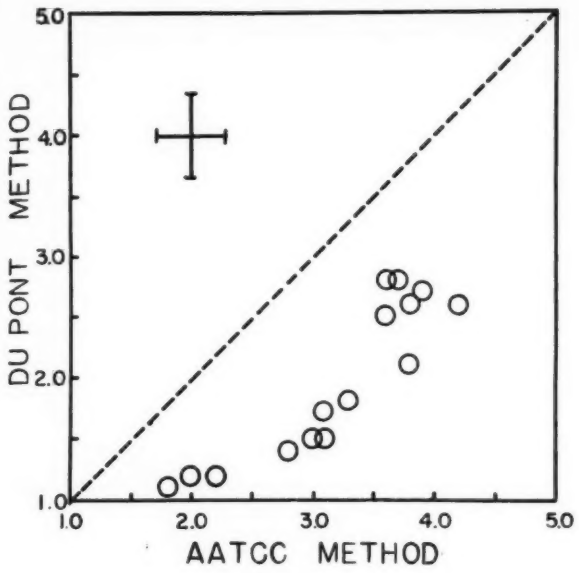

Figure 1
Comparison of the AATCC method and the DuPont method for white cotton fabrics

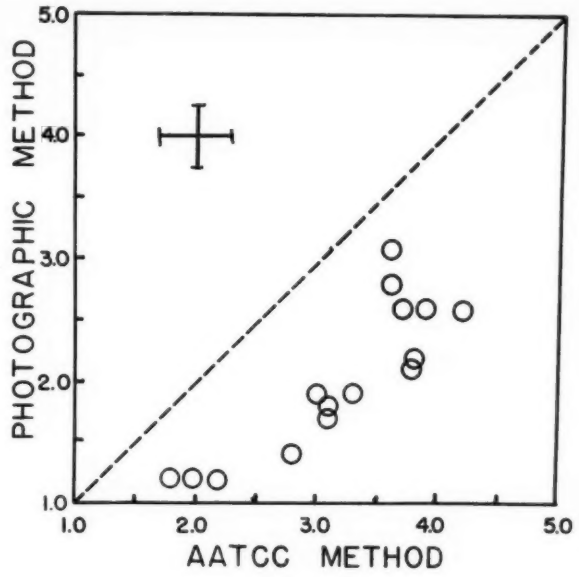

Figure 2
Comparison of the AATCC method and photograhpic method for white cotton fabrics

AATCC method are plotted against those obtained by the various other methods. Four points of interest can be analyzed for each comparison:

a) The general correlation of the various methods with the AATCC method.
b) The relative rating given to the fabrics by the various methods as compared to the AATCC method, ie, whether certain methods rate more or less severely. This is shown by the position of the points as compared to a 45° line.
c) The resolution of the various methods, ie, the part of the 1-to-5 scale covered by the various methods, shown by the distance on the X and Y axis covered by the points.
d) The variability (lack of reproducibility) of the various methods. This is indicated on the graphs by two lines forming a cross; the length of the line represents the 95 percent confidence limits of the ratings.

White Cotton Fabrics. The 15 white cotton samples, when rated by the AATCC method, covered a substantial part of the scale, from just below 2 to just above 4. Some of the raters commented that it was difficult to compare fabric samples with photographic standards. In addition, most raters felt that the lighting for the AATCC method was at a very sharp angle and greatly accentuated the wrinkles of the samples.

Figure 1 shows the relationship between the DuPont method and the AATCC method for this set of fabrics of identical construction but differing in degree of wrinkling. Considering the nature of subjective tests, the correlation can be considered good; the DuPont photographic standards resulted, however, in lower ratings, as can be seen from the position of the points below the 45 degree line. The DuPont ratings showed somewhat less resolution, indicated by the grouping of the points along the "V" direction. The variability of the DuPont method was similar to that of the AATCC method, as shown by the relative length of the bars in the upper left corner of the figure indicating the confidence levels of the two methods. The raters considered the DuPont photographic standards quite severe, and mentioned that the wrinkles in the standards did not look like the wrinkles in the majority of the fabrics rated. The DuPont lighting was considered less severe than the AATCC lighting.

Figure 2, representing the same relationship but for ratings of photographs of the fabrics compared with the DuPont photographic standards, shows, with few exceptions, a very similar distribution of the points to Figure 1. In addition to the advantage of the photographs providing a permanent record of the fabric appearance for later comparison with other fabrics, the variability of the photographic ratings was somewhat smaller.

Figure 3, comparing ratings obtained when using the Eastman and the AATCC photographic standards, again shows a good correlation. The two methods generally rated the fabrics similarly, except that the Eastman method seemed to give a wider spread, ie, better resolution, at the top of the scale. The variability between raters obtained by the Eastman method was smaller than that of the AATCC method. The raters commented that these standards probably represented best the wrinkles in most of the fabrics and covered the range of smooth to very wrinkled fabrics rather well.

Finally, in Figure 4, the AATCC ratings and ratings obtained with the previously described verbal standards are compared. Again, the average ratings correlated rather well except for a bigger spread along the vertical scale around the AATCC rating of 4. The variability obtained for the verbal method was the largest of all subjective methods.

Fabrics Varying in Color and Construction. Thus far, only samples of one fabric treated with varying resin concentrations were considered. This type of evaluation is valuable for the quality control of successive pieces

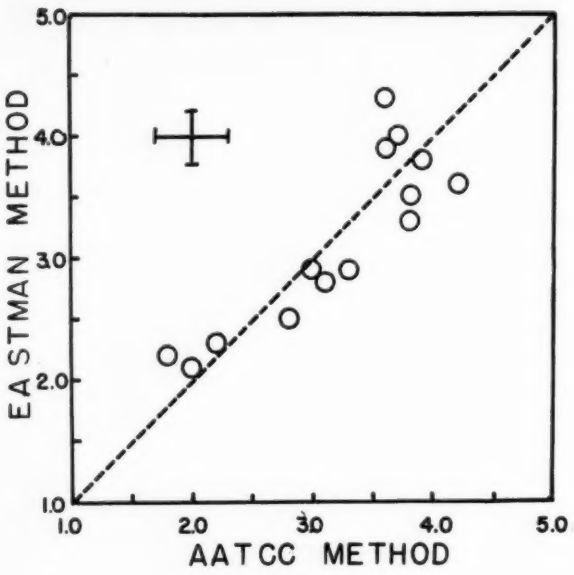

Figure 3
Comparison of the AATCC method and Eastman method for white cotton fabrics

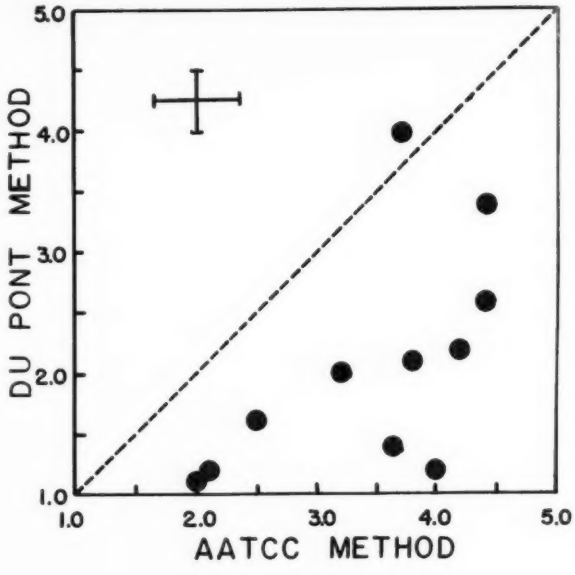

Figure 5
Comparison of the AATCC method and DuPont method for fabrics varying in color, texture, fiber content, and luster

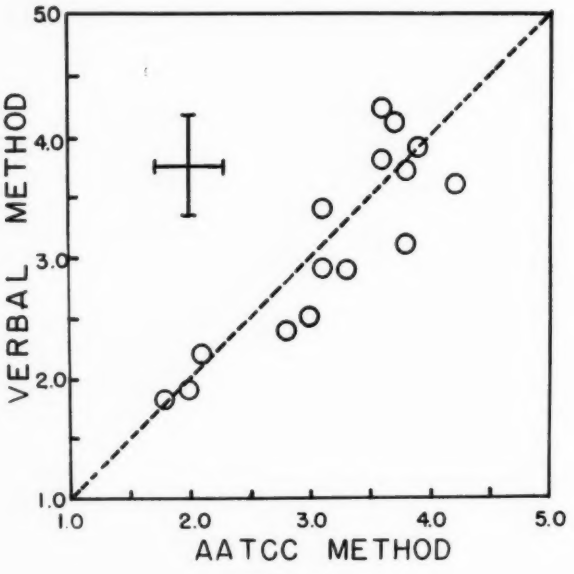

Figure 4
Comparison of the AATCC method and verbal method for white cotton fabrics

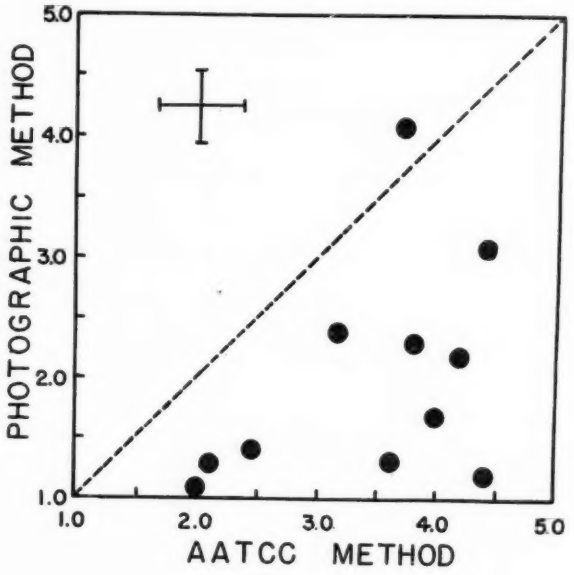

Figure 6
Comparison between the AATCC method and photographic method for fabrics varying in color, texture, fiber content, and luster

of the same fabric, and for the comparison of the efficiency of various resin treatments. Those interested chiefly in how their product will perform on the consumer level need, however, a broader picture of wash-and-wear, ie, a comparison of the degree of wrinkles in fabrics differing in color, fiber content, luster and texture. Figures 5 to 8 show the same comparisons as before, but for a number of fabrics including these variations. The ratings here were performed by three raters on three samples of each fabric, as prescribed by the AATCC standard method, and the average ratings and confidence limits given are those of all nine ratings.

In this group of fabrics, the AATCC method again covered a substantial portion of the scale, from 2.0 to 4.5. The panel commented that this method tended to minimize the color differences of the fabrics because of the low angle of light incidence.

Figure 5 is a comparison of the ratings obtained using the AATCC

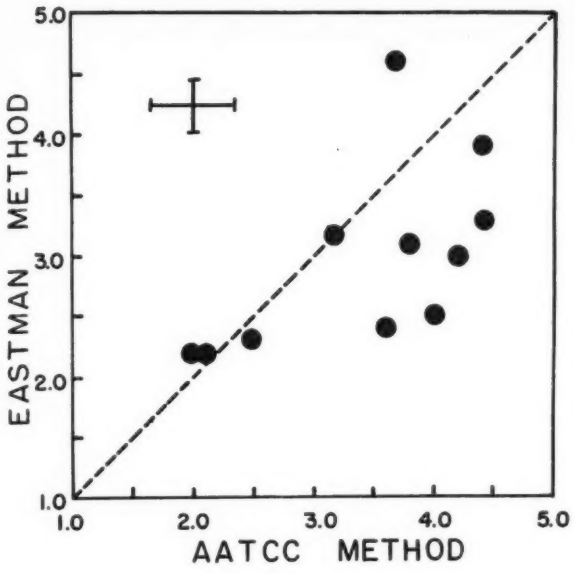

Figure 7
Comparison between the AATCC method and Eastman method for fabrics varying in color, texture, fiber content, and luster

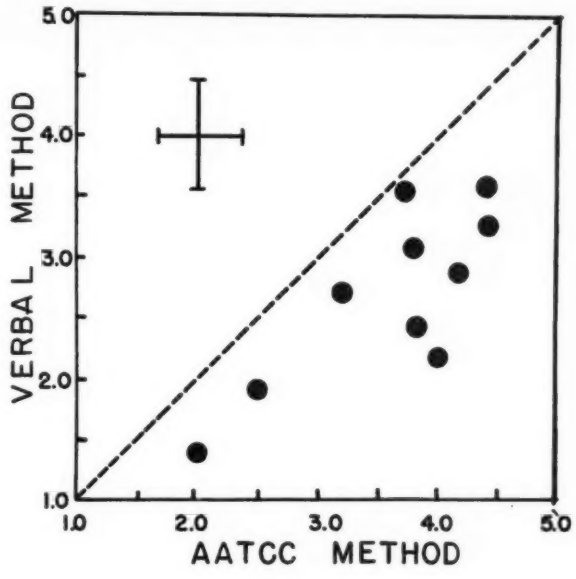

Figure 8
Comparison between the AATCC method and the verbal method for fabrics varying in color, texture, fiber content, and luster

and DuPont methods. As with the previous series, there was a fair correlation between these methods. The DuPont method again produces lower ratings but showed more resolution for the fabrics which had been given an AATCC rating of 4. The variability of the DuPont rating was lower than that of the AATCC ratings in this fabric series.

Figure 6 compares the results obtained by rating photographs of the fabrics against the DuPont photographic standards and the AATCC results. The correlation was fair, but the variability of the photographic ratings was higher than it had been in the previously discussed white fabrics.

Figure 7, comparing the Eastman and AATCC standards for the fabrics varying in color and construction, shows a poorer correlation than that obtained for the first series of fabrics, and a majority of the Eastman ratings were below the AATCC ratings. Again, the high rating points are less grouped on the Eastman than on the AATCC axis, indicating a better resolution for the Eastman method. This method again showed low variability, as it had in the first set of fabrics.

The verbal standards show surprisingly good correlation with the AATCC results for this set of fabrics (Figure 8), even though their variability was still relatively high.

In general, the correlation between all of the subjective methods was fair for fabrics of both series. The DuPont method generally rated fabrics lower than the other methods. Most of the other subjective methods showed better resolution than the AATCC method for fabrics which were rated around 4 on the AATCC scale. Of all the subjective methods compared, the Eastman method had the lowest confidence limits, ie, best reproducibility.

COMPARISON OF SUBJECTIVE AND OBJECTIVE "WASH-AND-WEAR" RATING METHODS——The results obtained on the Wrinklemeter[2] are shown in Tables II and III and compared with the AATCC and Eastman results in Figures 9 and 10. The 15 white fabrics of identical construction but varying in degree of wrinkling are indicated by open symbols, and the nine fabrics varying in the nine fabrics varying in construction[3] by shaded symbols. There was a fair correlation between the two methods, except that the instrument showed better resolution than the AATCC ratings particularly for AATCC ratings around 4. The variability of this objective method was much lower than that of the subjective methods. This desirable property would be expected for an objective instrument since the variations between individuals is not a factor.

When this objective method is compared with the Eastman method, an excellent correlation results. This correlation is quite remarkable in view of the fact that fabrics varying in resin treatment, color, texture, luster, and fiber content were included in the comparison. The only fabric which did not correlate well was Fabric 21, a cotton-Dacron blend which may have been glazed during ironing, which would affect its reflectance.

In Figures 9 and 10, the Wrinklemeter ratio, as explained under "Methods", was used in the comparison of the objective and subjective methods. If the instrument is to be used only for quality control or comparison of various resin treatments on the same fabric, it is not necessary to use the ratio, but rather, the direct reading of the Wrinklemeter can be employed. Such a technique would thus eliminate any errors introduced in the ironing of the fabric. However, when fabric varying in color, texture, fiber content, and luster are compared for degree of wrinkling, it is necessary to use the

[2] This instrument was made available for this work through the courtesy of the Clothing and Housing Research Division, Institute of Home Economics, Agriculture Research Service, U S Department of Agriculture.

[3] The printed and the dark red samples could not be evaluated on the Wrinklemeter because these reflectance readings went off scale; however, the instrument can be adjusted to evaluate dark samples if desired. The tan sample was included in this comparison.

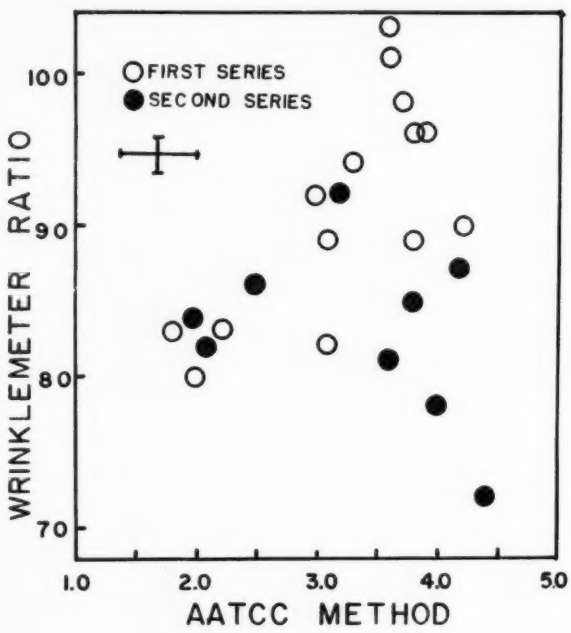

Figure 9
Comparison between the subjective AATCC method and the objective Wrinklemeter method

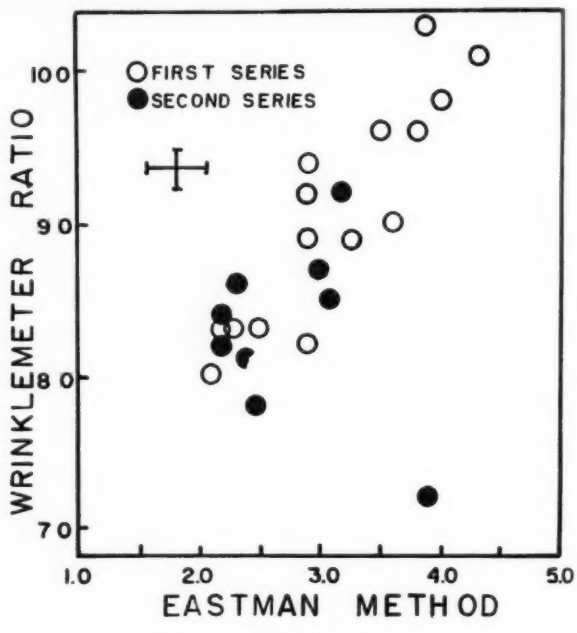

Figure 10
Comparison between the subjective Eastman method and the objective Wrinklemeter method

ratio of the wrinkled sample to that of the ironed sample.

This instrument was thus found to show promise as an objective method for rating the degree of wrinkling of fabrics. It correlates well with subjective methods and shows less variability than any of them. In addition, it permits a substantial savings in time and effort.

SUMMARY

Various subjective methods for evaluating "wash-and-wear" appearance were used to rate a number of fabrics varying in degree of wrinkling, color, construction, luster, and fiber content. Most methods correlated rather well with each other, except that the DuPont method gave generally lower ratings than any of the other methods. The reproducibility of the results obtained with Eastman standards appeared to be better than the other subjective standards.

Essentially, the same results were obtained whether fabrics or photographs of fabrics were compared with the same photographic standards; the use of photographs does have the advantage of giving a permanent record of the appearance of the fabric.

The correlation of the subjective ratings and the objective results obtained with a Wrinklemeter, a device which determines the reflectance of the fabrics by photoelectric means, was remarkably good, especially in view of the wide variety of fabrics and the large variation in the individual results obtained on each fabric by the subjective method. This instrument appears promising as an objective method for measuring the degree of wrinkling of a wide variety of fabrics.

ACKNOWLEDGMENT

The Intersectional Contest Committee of the Washington Section of AATCC wishes to acknowledge with thanks the statistical assistance provided by J E Koch, Agriculture Research Service, U S Department of Agriculture, both in the planning and the evaluation of the results obtained in this study.

LITERATURE CITED

(1) Committee on Wash-and-Wear, American Association of Textile Chemists and Colorists, "Wash-and-Wear Fabrics—Appearance After Home Laundering," Tentative Test Method 88-1958, *Am Dyestuff Reptr 48*, P578-580 (1959).
(2) Hebeler, H H, and Kolb, H J, "Remeasurement of Fabric Wrinkling", *Textile Research J 20*, 650-653 (1950).
(3) Hunter, R S, and Lofland, C A, "Optical Wrinklemeter", *Am Dyestuff Reptr 48*, 54-58 (1959).

THE following 1959 Intersectional Contest papers will appear in subsequent issues of the *Proceedings:*
"Fluorescent Brighteners and Bluing Agents in Wool Processing"—Delaware Valley Section
"Pile Fabrics"—Northern New England Section
"Accelerant Dyeing of Hydrophobic Fibers—Principles and Mechanisms"—Piedmont Section
"A Study of the Removal of Metal Ions from Cotton Fabrics"—Rhode Island Section
"The Continuous Wet Processing of Cotton-Acrilan Work-Clothing Fabric"—South Central Section

WINS 20th INTERSECTIONAL CONTEST
NORTHERN NEW ENGLAND SECTION

THE Northern New England Section's entry, entitled "Pile Fabrics", was judged the winner of the 20th International Contest, held October 9, 1959 at the Sheraton Park Hotel, Washington, DC, during the AATCC's 38th National Convention. It was the NNE Section's second first-place finish, the earlier winner having been in 1947.

Second place in this year's contest went to the Piedmont Section for its entry, "Accelerant Dyeing of Hydrophobic Fibers—Principles and Mechanisms". This marked the sixth consecutive year that a Piedmont Section paper had finished among the three award winners.

Third place went to the Delaware Valley Section for its paper, "Fluorescent Brighteners and Bluing Agents in Wool Processing".

Other entries in the Contest were as follows: "A Study of the Removal of Metal Ions from Cotton Fabrics", Rhode Island Section; "The Continuous Wet Processing of Cotton-Acrilan Work Clothing Fabrics", South Central Section; "Dyeing with Direct Dyes—The Effect of Various Salts", Southeastern Section; and "Wash-and-Wear Ratings: Subjective and Objective", Washington Section.

The Southeastern and Washington Section papers are presented in their entirety in this issue.

AATCC Calendar

COUNCIL, COUNCIL COMMITTEES, RESEARCH COMMITTEES
Nov 19-20 (Hotel McAlpin, New York, NY); Nov 19—Council Committees and Research Committees; Nov 20 (AM)—ECR, TCR; Nov 20 (PM)—Council
Jan 21-22 (Hotel McAlpin, New York, NY); Jan 21—Council Committees and Research Committees; Jan 22(AM)—ECR, TCR; Jan 22 (PM)—Council

NATIONAL CONVENTIONS
Oct 7-10, 1959 (Park Sheraton and Shoreham Hotels, Washington, DC); Oct 6-8, 1960 (Sheraton Hotel, Philadelphia, Pa); September 28-30, 1961 (Buffalo, NY); 1962 (Southern Region)

DELAWARE VALLEY SECTION
Oct 23 (Kugler's Restaurant, Philadelphia, Pa); Dec 4 (Philadelphia, Pa)

HUDSON-MOHAWK SECTION
Nov 20 (Jack's Restanurant, Albany NY); Jan 15, Mar 27 (Chelsea House, Tribes Hill, NY); May 20 (Ladies Night); June 24 (Annual Outing)

METROPOLITAN SECTION
Oct 16, Nov 20 (Kohler's Swiss Chalet, Rochelle Park, NJ); Jan 15, Feb 19 (Hotel New Yorker, New York, NY); Mar 18, Apr 22 (Swiss Chalet); May 20 (Ladies Night—Swiss Chalet); June, 1960 (Outing)

MID-WEST SECTION
Nov 7 (Bismarck Hotel, Chicago, Ill)

NIAGARA FRONTIER SECTION
Dec 11 (Annual business meeting, Buffalo, NY)

NORTHERN NEW ENGLAND SECTION
Oct 16 (Lexington Inn, Lexington, Mass); Dec 4 (Joint symposium with ASME Textile Engineering Div. Smith House, Cambridge, Mass); Jan 15 (Woodlawn Golf Club, Newton, Mass)

PIEDMONT SECTION
Jan 22-23 (Poinsett Hotel, Greenville, SC); April 2-3 (Hotel Robert E Lee, Winston-Salem, NC); June 3-4 (Outing—Ocean Forest Hotel, Myrtle Beach, SC); Sept 23-24, 1960 (Hotel Charlotte, Charlotte, NC)

RHODE ISLAND SECTION
Dec 4 (Annual Meeting—Johnson's Hummocks Grille, Providence, RI); Jan 29 (Johnson's Hummocks); Mar 25 (Providence Engineering Soc); April 29 (Student Night); June 24 (Outing—Metacomet Country Club; Sept 23, 1960 (Management Night); Oct 28, 1960 (Providence Engineering Society); Dec 2, 1960 (Annual Meeting—Johnson's Hummocks)

SOUTHEASTERN SECTION
Dec 5 (Atlanta Athletic Club, Atlanta, Ga)

WESTERN NEW ENGLAND SECTION
Oct 23 (Annual Meeting—Rapp's Restaurant, Shelton, Conn); Dec 4 (Hartford, Conn)

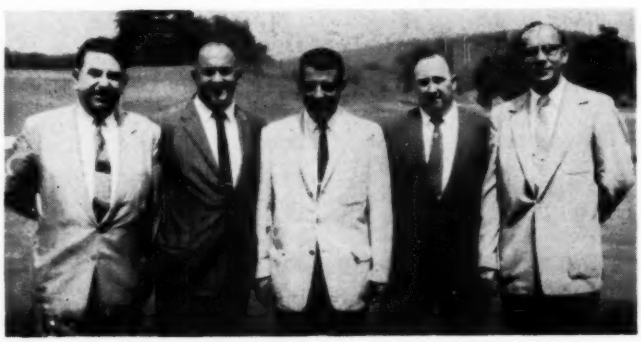

Photo taken at June 19th Outing of the Metropolitan Section (see page 59 of August 10th issue) shows, l to r: M F Costello and C W Farrell, outing cochairmen; J Komninos, Section chairman; E J Grady and G Heine, outing committeemen

Martin E Mangarelli (right), who took low gross honors in golf at the Metropolitan Section's 1959 outing, receives trophy from cochairmen M F Costello (left) and C W Farrell (center)

Membership Applications

NEW ENGLAND REGION

NORTHERN NEW ENGLAND SECTION

Senior

Russell E Dimery—Chemist, Gagliardi Res Corp, E Greenwich, RI. Sponsors: D D Gagliardi, R G Perriello.

Francis T Spencer—Product dev mgr, Pepperell Mfg Co, Biddeford, Me. Sponsors: D H Thomas, R Lachance.

Associate

Alphonse R Presto—Chemist, J P Stevens & Co Inc, Westfield, Mass.

Transfer from Junior to Senior

Joseph H McCusker—Chief chemist, Res & dev div, Chandler Mfg Co, E Taunton, Mass. Sponsors: E J McNamara Jr, J P Ploubides.

WESTERN NEW ENGLAND SECTION

Transfer from Junior to Senior

William R Etchells—Finishing specialist, American Thread Co, Willimantic, Conn. Sponsors: W D Lowell, P G Morin

CENTRAL ATLANTIC REGION

METROPOLITAN SECTION

Senior

Irwin Bendell—President, Thrift Dye Works Inc, Paw Creek, NC. Sponsors: M L Slesinger, M J Mauser.

Robert H Shaw—Wool merchandising mgr, Coats & Clark Inc, New York, NY. Sponsors: R B Hallowell, N Johnston.

Transfer from Junior to Senior

Alexander V Finn—Chemist, Sandoz Inc, New York, NY. Sponsors: A W Spencer, J O Whitaker.

NIAGARA FRONTIER SECTION

Senior

George Morrison—Supt dyeing, Julius Kayser Co Ltd, London, Ont, Canada. Sponsors: K A Lister, N J Mohoruk.

DELAWARE VALLEY SECTION

Senior

Alberto W Ducker—Chemist, Material Lab, New York Naval Shipyard 13, Brooklyn, NY. Sponsors: G J Mandikos, G M Kidder.

Transfer from Junior to Senior

Thomas G Ellington Jr—Tech service rep, E I duPont de Nemours & Co, Inc, Wilmington, Del. Sponsors: C W Holweger Jr, R E Ritter.

H Roy Kennedy—Tex chemist, E I duPont de Nemours & Co, Inc, Wilmington, Del. Sponsors: V D Lyon, P L Meunier.

James A Murphy—Research chemist, Joseph Bancroft & Sons Co, Wilmington, Del. Sponsors: C D Stump, G A Billingsley.

SOUTHERN REGION

WASHINGTON SECTION

Senior

M Kathryn Wharton—Chemist, National Bureau of Standards, Textiles section, Washington, DC. Sponsors: F H Forziati, A M Sookne.

Junior

Claudia F Vosbeck—Chemist, National Bureau of Standards, Textiles section, Washington, DC. Sponsors: F H Forziati, A M Sookne.

Transfer from Junior to Senior

Werner Pels—Textile engr, National Cotton Council of America, Washington, DC. Sponsors: J W Howard, N F Getchell.

PIEDMONT SECTION

Senior

Arthur Davidian — Dir, consumer evaluation lab, Lyman Printing & Finishing Co, Inc, Lyman, SC. Sponsors: L T Kelly, J D Rulli.

Richard W Reagan—Group leader, staple fiber dev, tex res dept, American Enka Corp, Enka, NC. Sponsors: T R Scott Jr, D J Godehn.

Edward J Snyder Jr—Mgr & vice pres, E J Snyder Co Inc, Albemarle, NC. Sponsors: W H Wadsworth, M H Newton.

Charles Tomasino—Chemist, Celanese Corp of America, Charlotte, NC. Sponsors: F Fortess, W J Myles.

SOUTH CENTRAL SECTION

Junior

Richard B Anderson—Manfacturing trainee, Peerless Woolen Mills, Rossville, Ga.

SOUTHEASTERN SECTION

Senior

David Walker—Purchasing agent, Eagle & Phenix Div, Reeves Bros Inc, Columbus Ga. Sponsors: J C Coole, G H Dockray.

Benjamin F Fuller— Lab supv, Cedartown Textiles, Div Amerace Corp, Cedartown, Ga. Sponsors: H W Berry, A Haavie.

STUDENT CHAPTER

LOWELL TECHNOLOGICAL INSTITUTE

Student

Thomas F Saunders—Student of textile chemistry, Lowell Technological Institute, Lowell, Mass.

UNCLASSIFIED

Senior

Maria del Carmen M Peorosa—Supervisor, DuPont S A de C V, Mexico, DF, Mexico. Sponsor: R Alonzo.

Junior

Luis A Forgen—Laboratory worker, DuPont S A de C V, Mexico, DF, Mexico. Sponsor: R Alonzo.

Elected Members

No designation after name indicates Senior
(A) indicates Associate
(J) indicates Junior
(S) indicates Student
*indicates transfer from another class of membership

September 24, 1959

NEW ENGLAND REGION

NORTHERN NEW ENGLAND SECTION

Louis Leo
Wilbur S Taylor

CENTRAL ATLANTIC REGION

DELAWARE VALLEY SECTION

Ruth Kikuta Higuchi

METROPOLITAN SECTION

Rudolf Berhourd
Mitchell Goldstein
Edward N Manning

SOUTHERN REGION

WASHINGTON SECTION

Charles G Tewksbury

PIEDMONT SECTION

Herman P Briar

SOUTHEASTERN SECTION

*Charles E Gavin**

UNCLASSIFIED

Gerard O Bonenfant
Arnold A Rhomberg
William H Kemp (A)

A COMPREHENSIVE

SUMMARY OF THE

RECENT WASHINGTON

CONVENTION, TOGETHER

WITH EXTENSIVE

PICTORIAL COVERAGE

WILL BE FEATURED

IN THE

NOVEMBER 2 ISSUE

OCTOBER OCTET
1959

Inter Alia—Inter Nos

P J WOOD

LANGUAGE

In a very apropos and revealing article, "Why Can't Our Children Speak a Foreign Language?", published a little while ago in "Woman's Day", Jacob Ornstein, the linguistic expert, poses a question that is hard to answer.

He reports on a student conference in Paris at which our country was represented by 20 young people from American universities. After a social session where the delegates had an opportunity to mix informally, an American reporter, who was present, wrote to the president of his alma mater saying, among other things, "I was ashamed that in this group of America's finest youth, not a single student could speak the language of the other delegates. The European and Asian boys and girls, by painful contrast, went about chattering glibly in English, French, German, Italian and a score of other tongues. What's wrong?"

We know that all people cannot be interested in the same things, otherwise we would all be doctors without patients to treat, lawyers without clients to represent, parsons without sinners to save, scribes without readers, and vice versa, ad libitum.

Nevertheless, language is one of the basic methods of communication; and the acquiring of a foreign language opens up a new avenue of communication, both by the spoken and the written word. Wasn't it Charlemagne who said "Mit jeder neu gelernte Sprache gewinnt man eine neue Seele", which broadly conveys the idea that with every new-learned language, one gains a new mind.

For a chemist, it has always seemed to us that the German language is an essential element of education - so much that is germane to a thorough understanding of this fascinating science has been written by German scientists. That is not to say that much of interest to the chemist is not to be found in the writings of French, Dutch, Swedish and Italian scientists, to mention a few of the other great body of working and thinking individuals who have contributed to the ever-increasing store of knowledge available to students of today.

Only the other day, from Taiwan, we received a copy of the Journal of the Chinese Chemical Society, a very interesting compilation showing what is being accomplished by chemists in that faraway region. As all that we know of Chinese is the numbers from 1 to 10 and a few desultory remarks including "Hello" "Good morning" and the like, we were more than glad to find that this Journal was written in perfect English. At least we can write our name in this ancient and picturesque language, it looks like a sketch of three pine trees growing one above the other on a hillside.

To make the Grand Tour of Europe in the times of the stage coach, it appears that the three languages considered necessary were English, French and German. Undoubtedly, armed with these three tongues, the traveller would find, anywhere he went, someone who would be able to converse with him in at least one of these three languages.

Thomas Mann, a word-master, if ever there was one, said this about speech: "Speech is civilization itself. The word, even the most contradictory word, preserves contact -- it is silence which isolates".

COMMITTEE

Paul Smith says, "The important factor is not the size of the group of minds, but the size of minds in the group".

NEXT TO GODLINESS

According to the 1956 national housing survey of the Bureau of Census of the United States, out of the 54,300,000 dwelling units in the land, 43,800,000 had installed bathtubs or showers for the family's exclusive use, 80.6%; 1,300,000 of the dwelling places were supplied with bathtubs or showers which they shared with one another, 2.4%; and, alack, likewise alas, nine million or 16.9% had no bathing facilities at all.

If it makes us feel better off to compare ourselves with others still worse off, we may recollect that there were probably no bathtubs or showers in ancient Greece; Archimedes is said to have discovered the principle of flotation in one of the public bathhouses; "Eureka!" said Archie, running out into the public street, stark undressed, so we are told; a truly scandalous incident and much to be deplored; nevertheless we honor his memory for two things: 1) he evidently took a bath, once in a while; 2) he discovered what the force is that keeps a floating object afloat, and the principle of the lever, bragging that he could move the world, if he had a spot to place his fulcrum.

Similarly Diophantus, sometimes called "the father of algebra", whose odd name has been immortalized by the so-called Diophantine analysis -- the rational solution of indeterminate equations with rational coefficients. It seems quite certain that the contemporaries of Diophantus were not overblest with bathtubs or showers, at least not of the private and exclusive variety. They flourished odoriously in the fourth century AD.

Brains or baths, they had the brains. We are supposed to have both.

READING

Mark Twain remarked that there is no difference between those that can't read and those that don't read.

"Quote", quoting from the Institute of Student Opinion, reports that teenagers read four times as much as their parents; however it is significant to note that, while only 32% of the younger set spend one hour a day reading, 65% watch TV for two hours a day or more.

What the value of reading is in terms of viewing television, we do not know. It would be impossible to draw a comparison, most likely, on account of the variation in value of books, on the one hand, and of the instruction to be derived from television on the other. Many shows which we have seen would fall in the category of our late friend A F Lichtenstein, which he described as "bum to middling"; and that would be a lenient evaluation.

EASY LEARNING

We always envied the Farquharson boys, who went to the Manchester Grammar School, where they learned Latin from that unique "Allen's Latin Grammar" written mostly in rhyme. Here's an example:

"Males are ligo, vespertilio,
Cardo, ordo et papilio". Then again:

"Many Latin nouns in is'
Are feminino generis". Once more:

"Malo, I prefer to be
Malo, in an apple tree
Malo, than a naughty boy
Malo, in adversity".

It seems to us, that if this ingenious system of learning Latin had been more prevalent, we would have had more and better Latin scholars. Latin would have been as easy to learn as were the multiplication tables, which had a sort of a rythm to them that stuck in the memory; how many of us, even today, after a lapse of x years, run speedily over the seven times, eight times or nine times tables, almost unconsciously in no time, and frequently come up with the right answer.

POWER

"It is quite natural for us to wish for power to adjust the apparent inequalities and injustices we see around us. But perhaps such endeavor on our part would carry with it an all too grave responsibility. We men, with our short-sighted wisdom might do more far-reaching injustices in setting right what seems to us to be wrong. We cannot see the thoughts that lie behind the facial mask. We cannot see the real intent buried deep within the heart. Perhaps, then, it were just as well to let Providence guide the destinies of the world, and to cooperate with that Providence, rather than to assume for ourselves the role of Creator and Judge".-- From "Unto the Hills" by Richard L Evans.--Q.E.F.

News of the Trade

Task Group Formed to Expedite USDA "Wash-Wear" Research

Intensified efforts to improve "wash-wear" cotton fabrics have been instituted at the Southern Utilization Research and Development Division in New Orleans, La, the U S Department of Agriculture center for cotton utilization research. A Wash-Wear Task Group under the direction of J David Reid will coordinate efforts of various investigation groups.

"Wash-wear is the most important development in cotton finishing in many decades," said C H Fisher, director of the Southern Division, in announcing the formation of the Task Group. "We have already made significant contributions to the development of wash-wear cottons, but it is imperative for us to review our efforts and make them even broader and more efficient."

He pointed out that "wash-wear" fabrics increased domestic consumption of cotton by 10% during 1958.

Problems in the "wash-wear" finishing of cotton fabrics are being attacked from a number of different angles at the Southern Division to supply know-how for the production of better "wash-wear" cotton articles for the consuming public.

Special emphasis will be placed on commercial possibilities of research developments, and contacts and cooperative work with garment manufacturers, commercial laundries, the Institute of Home Economics, state experiment stations and others engaged in research and practical application of new findings.

"We are very anxious to do everything we can to make ideal 'wash-wear' garments available to the public as soon as possible," Dr Fisher said. "Such garments would have smooth, flat seams, sharp creases where creases are wanted, resistance to wrinkling during wear, and a finish that would be durable to laundering for the life of the fabric."

•

NSCC Breaks Ground for Major Lab Expansion

New construction that reportedly will increase National Starch and Chemical Corporation's research and technical development facilities by more than 50 percent was begun late last month with the breaking of ground for two additional buildings at the company's Alexander Research Laboratories in Plainfield, NJ. Construction is scheduled for completion some time early next year.

One of the new buildings will house the Central Manufacturing Department and will provide office space as well for several technical development departments. The new laboratory unit will be occupied by the Structural Products, Starch Research and Control Methods lab groups.

National's major research and development operations have been centralized at Plainfield since the first wing of its modern, campus-style lab was constructed there in 1952. Other research and development facilities are located in Chicago and San Francisco. Additional laboratories are maintained in Canada at Montreal and Toronto, and at Slough, Bucks in England.

Receiving advice and encouragement from below, Donald D Pascal (top right), president of National Starch and Chemical Corp, mans the controls of digging machine during recent groundbreaking at the company's Alexander Laboratories, Plainfield, NJ. Company officials shown participating in ceremonies are (left to right): Eugene Shloss, head of engineering; W Vincent Upton, laboratories administrator; Carlyle G Caldwell, research director; Mr Pascal.

•

American Dyewood to Build New Warehouse and Standardization Building

American Dyewood Co, Inc has broken ground for a new warehouse and standardization building at its Belleville, NJ plant. The Company, founded in 1798, is a leading manufacturer and distributor of dyewoods, tannins, and aniline dyestuffs. Its Belleville plant covers approximately six acres and includes more than 20 production buildings.

•

Quaker Chemical Sets Up Scholarship Fund for Children of Employees

Quaker Chemical Products Corp, Conshohocken, Pa, has established a college scholarship foundation for children of its employees.

Quaker Chemical will make available one or more scholarships each year to outstanding high school seniors. These will be scholarships granted for undergraduate study and leading to a Bachelor's Degree in the Technical and Liberal Arts fields in any accredited United States college or university. They will be awarded to seniors who not only attain high scholastic standing but also have demonstrated the qualities of leadership, integrity and industry.

Such scholarships will be available beginning June, 1960 and will provide a yearly maximum of $1,500 per recipient with a total not to exceed $6,000 per recipient.

8th CFC Draws 400

Improved chemical finishes for "wash-and-wear" woven cottons and knits and a new water-repellent finish were among the topics discussed at the eighth annual Chemical Finishing Conference held October 7 at Washington, DC.

James B Irvine, director, product development, Quaker Chemical Products Corp, Conshohocken, Pa, said that the market for knit cotton dresses and knitted nightwear has increased significantly since the introduction of stabilizing chemical treatments.

These chemicals are similar to those used for "wash-and-wear" woven cotton fabrics. When applied to knits they prevent excessive shrinking and stretching, preserve the surface appearance of the fabric through repeated laundering and wearing, improve the "wash-and-wear" ability of the fabric, and improve wrinkle resistance of the fabric while being worn, according to Mr Irvine.

"Knit dresses, of which only seven percent were made of cotton in 1955, now claim 35 percent of that market. In knitted nightwear, cotton garments have more than doubled their percentage of the market," Irvine said.

The conference, sponsored by the National Cotton Council, drew a record attendance of almost 400 research scientists, textile finishers and chemical manufacturers.

In another presentation, Arnold M Sookne, associate director, Harris Research Laboratories, Inc, Washington, DC, reported successful development of a new epoxy resin finish for "wash-and-wear" cottons.

Epoxies have several advantages over other finishes used today, but have had limited commercial use because of their higher cost. Mr Sookne suggested a blend of the new epoxy resin with lower-cost resins to produce a finish which could find wide commercial acceptance. Among other advantages, epoxy finishes are said to offer extreme durability to strong acid sours used by commercial launderies.

The U S Department of Agriculture's Southern Utilization Research and Development Division in New Orleans reportedly has solved the problem of a permanent water-repellent finish for cotton. Charles J Conner reported a new type silicone alloy water-repellent treatment which is said to be extremely durable to all types of laundering.

The finish does not give the fabric a stiff hand, according to Conner, and may be combined with "wash-and-wear" finishes. It appears to hold much promise for treating cotton rainwear, upholstery and industrial fabrics.

Three other papers were presented which described basic research in finishing. Wilson A Reeves, U S Department of Agriculture, SURDD, New Orleans, discussed the possibility of curing the resin when the cotton fiber is swollen to a certain degree so that wrinkle recovery will be effective when the fabric is wet as well as when dry. This would eliminate drip drying. The housewife could choose either to tumble dry or damp dry by conventional methods any cotton item which has both wet and dry wrinkle recovery.

Giuliana C Tesoro, J P Stevens & Co, Garfield, NJ, presented evidence that the "wash-and-wear" chemicals furnish a "memory" for the position in which the fabric was cured by cross-linking the fiber molecules rather than by resin formation.

Hermann Rath, German Textile Research Institute, Reutlingen-Stuttgart, Germany, presented a theoretical discussion on the application of resin finishes to cotton. Dr Rath, a leading German authority on textile finishing, proposed the possibility of spraying the resin solution on the cotton fabric rather than the current practice of immersing it in a resin bath.

Conference General Chairman was Lawrence Marx Jr, vice president, United Merchants and Manufacturers, Inc, New York.

Session chairmen were Richard O Steele, head, textile research laboratories, Rohm & Haas Co, Philadelphia, and Lawrence L Heffner, cotton utilization specialist, U S Department of Agriculture, Clemson, SC.

•

PTI Progress Fund in Final Phase

A preview tour of Philadelphia Textile Institute's new Student Union Building will highlight an alumni campus brunch to kick off the final phase of PTI's Diamond Jubilee Progress Fund on Saturday, Oct 24.

Bertrand W Hayward, PTI president, said alumni will be given a report on the progress already made by the fund. The campaign, to date, has raised $83,000 to improve educational and research services and to expand facilities at PTI. It seeks to bring this to a total of $150,000 by the year's end.

Alumni also will hear plans for PTI's Diamond Jubilee Celebration Dinner, which will honor John B Kelly Sr on Sunday, Nov 22, at the Bellevue-Stratford Hotel. Everett L Kent, president of the PTI Foundation, has been named dinner chairman.

The $675,000 structure covers 29,568 square feet, of which 12,134 square feet are taken up by a gymnasium. The remainder of the building includes a cafeteria, kitchen, faculty dining room, stage, instructors' room, eight student activity rooms and a students lounge.

TO Manufacturers of Dyestuffs, Textile Chemicals, Wet Processing Machinery, Laboratory Equipment, and Incidentals for the Wet Processing Plant:

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ANNUAL PROCESSING REVIEW NUMBER

will appear on December 14th, 1959. You are cordially invited to submit information concerning your new products that have been placed on the market since November, 1958.

How to submit information:

Please list your products alphabetically, compiling each catagory (ie, chemicals, dyestuffs, etc) separately. Information should include the trade name of the product and a BRIEF summary of its uses and properties. The information should be typed, double-spaced, on 8½ x 11 sheets of paper. If illustrations are necessary, glossy photos or black ink drawings should be furnished. If the trade name is registered or the product is patented, please so note.

In order to insure your new products being listed in our issue of December 14th, information concerning them should be in our office no later than November 16th.

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Eccleston

Otto

Sheehan

Arnold, Hoffman & Co, Inc has announced that, consequent upon the return of *T Richardson* to Imperial Chemical Industries, England, *Donald J Eccleston* has been appointed sales manager.

•

Henry F Herrmann, executive director of The Vat Dye Institute for the past three years, has retired. Announcement was made by H J Daigneault, president of the Institute.

While no successor to Mr Herrmann has been appointed, the work of the Institute is going forward without interruption, Mr Daigneault stated. "Exhaustive market research on the reasons for color preference is being conducted under the direction of our advertising agency, Anderson & Cairns, Inc" he stated. "Based on the results of the survey, promotional plans for 1960 will be presented at a general membership meeting later this year."

•

H Stanley Lawton has joined the Armour Industrial Chemical Company as director of commercial development, a newly created position.

Before going with Armour, Mr Lawton was vice president of sales and development for Michigan Chemical Corp.

•

Paul S Trible has been appointed to the newly created position of general sales manager of the International Salt Company.

Mr Trible joined International Salt in 1937. His career has included special sales assignments in the company's headquarters office in Scranton, as well as sales supervisory positions in the company's field offices. When the company established a southern division in 1953, Mr Trible moved from Richmond, where he had been southern sales manager since 1948, to New Orleans to become southern division manager.

•

Announcement has been made of *Paul M Otto* as the Putnam Chemical Corporation's sales representative for the wool processing industry. Mr Otto will cover the southern New England states and part of the Mid-Atlantic territory, with headquarters in Beacon, NY.

Mr Otto was with the Botany Mills for a considerable number of years, and with Verona Dyestuffs in a technical sales service capacity.

•

Robert C Douthit and *Donald H Sinner* recently joined the Development Department, Union Carbide Chemicals Co, division of Union Carbide Corp, at South Charleston, W Va.

•

Henry W Bajak has been named assistant to the president of Arizona Chemical Co by the firm's directors.

Arizona Chemical, a jointly owned subsidiary of American Cyanamid Company and International Paper Company, is in the tall oil and sulfate turpentine industries.

Mr Bajak has been with Cyanamid's fine chemicals division since 1952 and he has served in a variety of sales and adminstrative posts.

In his new position, he will be responsibile for coordinating Arizona's market planning, research and new product development. He will also serve as a general administrative assistant to the president.

•

Richard E Knopf has been named assistant manager of the New York Office of the Dow Corning Corp. He will be in charge of silicone sales and promotion to the textile industry in the New York area. This activity is now centered at the new Dow Corning offices in the Corning Building at 717 Fifth Avenue.

Mr Knopf was formerly supervisor, textile industry sales, for Dow Corning.

•

William C Sheehan has joined the staff of Southern Research Institute, Birmingham, Ala, as head of the Textile Section. He will direct the Institute's program of textile and fiber research, including work currently in progress on sizing, finishing, and flameproofing.

Dr Sheehan was formerly with the Du Pont Company at Richmond, Va, where he did research on cellulose, particularly on cellophane and special-purpose films.

•

United Merchants and Manufacturers, Inc has announced the appointment of *Ernest St Louis* as vice president of Valchem in charge of chemical manufacturing and of *Peter Benjamin* as vice president of Valchem in charge of sales.

Valchem, located at Langley, SC, is the chemical manufacturing unit of United Merchants and Manufacturers, Inc and is under the supervision of *J W Houth,* vice president of United Merchants and Manufacturers, Inc and general manager of the Finishing Plants Division.

This unit manufactures almost all of the organic chemicals used by the various United Merchants and Manufacturers, Inc organizations.

•

James A Robertson has been appointed manager of the newly formed analytical department at Food Machinery and Chemical Corporation's Chemical Research and Development Center in Princeton, NJ. Dr Robertson had been supervisor of the physical instrument section at the center.

Replacing Dr Robertson in the physical instrument section is *Anthony J Durbetaki,* formerly supervisor of the analytical section of the inorganic department.

Fred Bower recently joined the research group as chemical microscopist.

•

Announcing

MOROPOL 762

. . . a DURABLE Non-Ionic Resin Softener

Moropol 762 increases tear strength and abrasion resistance, and adds to the crease angle in resin treated fabrics. These properties are durable for the life of the fabric.

The "hand" imparted by Moropol 762 as a resin softener is silkier than with other durable softeners, and is excellent for fabrics like women's apparel. It does not contribute to the pickup of soil and will not retain soil or dirt during laundering, as do many thermoplastic resin softeners. This feature recommends its use on white goods in preference to acrylate, silicone, and polyethylene softeners.

General Properties

Chemical Nature:	An aqueous non-ionic dispersion of an epoxy type plasticizer.
Appearance:	Creamy white emulsion
Concentration:	40%
pH:	6.0 — 6.5
Compatibility:	Compatible with water phase resin solutions as well as cationic, acid, alkaline, and metal salt additives.
Stability:	Freeze-thaw and storage stable for over 6 months.
Shipped:	in 55 gal. drum containers . . . exact net wt. 440 lbs.

Let us send you technical data on Moropol 762.

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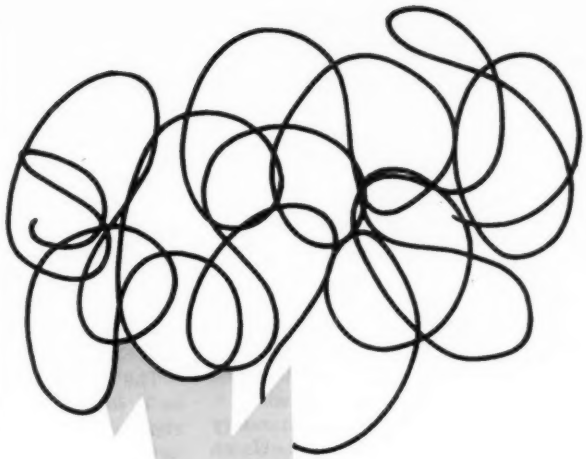

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Sandoz

THINKS AHEAD WITH TEXTILES SANDOZ

Cox

Metro-Atlantic, Inc, Centredale 11, RI, has announced the appointment of *Donald Cox* to the staff of the Technical Service Laboratories.

Mr Cox has had both laboratory and plant experience at Union Wadding Company and Sayles Finishing Plants, Inc.

●

Glen Carnine, who has been quality control chemist at Becco's Vancouver, Wash, plant for the past five years and chief chemist for three years, has been appointed chief control chemist at the Buffalo main plant of Becco Chemical Division, Food Machinery and Chemical Corp.

The position, a newly-created one, has been established to coordinate the control program for the quality of all Becco products, including the solid peroxides, which are made in Buffalo. In his new assignment, Mr Carnine will be responsible for all quality control activities at Buffalo and at the same time will continue to supervise this phase of the Vancouver operations in order to keep both plants consistent in the quality of their output. He will report to *Henry Vogt*, Buffalo plant manager.

●

Rohm & Haas Co has announced the appointment of *John C Haas* as director of purchases and traffic.

Mr Haas has been serving as vice president in charge of industrial relations. In his new assignment, effective October 19, he succeeds *Peter J Clarke*, former director of purchases, who died on September 17.

●

Harvey N Young has been appointed superintendent of boarding and dyeing processes at Hanes Hosiery Mills Co. Mr Young takes the place of *Curtis H Edwards*, who retired September 30, after 35 years of service.

Mr Young, who has been associated with Hanes for 27 years, has been assistant superintendent of the boarding processes and a member of Hanes production management board since 1958.

●

Frank P Kelly has been appointed manager of manufacturing operations for the Philadelphia-based Brown Instruments division of Minneapolis-Honeywell Regulator Co.

He succeeds *Frank M Rea*, who has been assigned to Honeywell's Industrial Products Group.

Kelly joined the Brown Instruments division in 1943 and has held a number of posts, including that of purchasing agent, manager of manufacturing assembly operations, and general superintendent.

●

The appointment of *Frank P Corso* as a research and development field representative in the Industrial Products Section of the Colgate-Palmolive Company's Household Products Research and Development Department has been announced.

Mr Corso joins Colgate from the American Cyanamid Co where he was chief control chemist in the Surgical Products Division.

●

Rodney Hunt Machine Co, Orange, Mass, has announced that *Harold H Belcher* has been elected to the board of directors of the company and vice president in charge of engineering.

The announcement of Mr Belcher's appointment as vice president came simultaneously with the announcement of the formation of an Engineering Division.

As vice president, Mr Belcher will manage the Engineering Division and will be responsible for directing such functions as design, product engineering, standards, product development and patent administration.

Mr Belcher has been with the Company since 1943. Prior to joining Rodney Hunt, he was chief engineer for the Philadelphia Drying Machinery Division of Proctor and Schwartz.

●

Paul K Lawrence, a widely recognized expert on foreign chemical imports and tariffs, retired from the Du Pont Company at the end of September.

Mr Lawrence, who was manager of trade relations for Du Pont's Dyes and Chemical's Division, specialized in the field of foreign imports for a major portion of his career. He worked for the United States Tariff Commission for a number of years; has been a long-time active member and officer of the Synthetic Organic Chemical Manufacturers Association, and has served as an adviser on dye and intermediate imports to a number of government agencies.

●

McClelland

Appointment of *Charles P McClelland* as associate director of the Technical Service Laboratory, Tarrytown, NY has been announced by Union Carbide Chemicals Co, division of Union Carbide Corp. In his new position, Mr McClelland will administer Carbide's university fellowships supported by the marketing group, follow customer requirements for improved specification standards for industrial chemicals, coordinate Technical Service Laboratory training functions, and also customer service activities.

In 1955, Mr McClelland was appointed assistant manager of UCC's Technical Service Department, in which position he will also continue.

●

The appointment of *Charles P Bertland* as assistant general manager of American Cyanamid Co's Fibers Division has been announced.

In his new post, Mr Bertland will work closely with Alden R Loosli, division general manager, in directing over-all operations of the division, with particular emphasis on sales and merchandising activities.

Mr Bertland was formerly with Beaunit Mills, Inc, where he was executive vice president in charge of sales for the Fibers Division.

●

C C Schulze has been appointed to the newly established position of assistant general manager of the Dyestuff and Chemical Division of General Aniline & Film Corp. In his new position, one of his major responsibilities will be to coordinate long-range expansion projects from research to commercialization for the Division.

Succeeding Dr Schulze as director of manufacturing is *Joseph W Conlon*, formerly plant manager of the Division's manufacturing operations at Rensselaer, NY.

John C Lawler, formerly special projects coordinator for the Division's Manufacturing Department, succeeds Mr Conlon as plant manager at Rensselaer.

●

Abstracts

Use of Trichloroethylene in Continuous Scouring and Bleaching of Textiles

White, W A S, Ross, H J and Crowder, N F, *J Textile Inst 50*, P274-93, P320-9, June and July, 1959

Most textiles contain fatty matter of one kind or another, which may be originally present in the raw fiber and also derived from oily substances added to facilitate spinning or weaving. In addition, all classes of textiles are liable to become accidentally contaminated with oil during processing.

It is not always necessary to remove oily matter from textiles in order to fit them for their ultimate use, but very frequently this has to be done, the normal process being one of saponification or emulsification, using aqueous solutions containing alkalis and detergents. Basically, this is not the most efficient way of removing oily matter, and the use of suitable organic solvents is a subject that has been of interest for many years.

The present paper is not concerned with the incorporation of trichloroethylene as an assistant in more or less conventional aqueous scouring or bleaching liquors, but deals with true solvent-extraction techniques where the textile is immersed in liquid trichloroethylene in specially designed plant.

Previous work on solvent-extraction systems for scouring textiles is briefly reviewed. Details of an improved continuous system, based on trichloroethylene, are given, including a description of the pilot plant employed in the investigation. A commercial plant now in operation is also described.

The trichloroethylene treatment, followed by continuous desizing with sodium peroxide, has been applied to a variety of cotton piece-goods as a preparation for dyeing.

One of the prime functions of the cotton bleaching process is to make the material absorbent, and it was considered that this main objective might be expeditiously obtained by including solvent-extraction as one stage of the bleaching process. The main object of the extraction would be to remove the natural wax of the cotton, which is beneficial during manufacturing operations but objectionable during bleaching because of its water-repellency.

Laboratory work and plant trials have shown that continuous dewaxing with trichloroethylene is a practical proposition and facilitates subsequent desizing and bleaching, especially by continuous processes in which an essential requirement is that the finished material should have a high standard of absorbency. In particular, dewaxing enables a white, absorbent cloth to be produced in a single-stage peroxide or chlorite process of short duration.

Elimination of alkali scouring is helpful in reducing weight loss and facilities treatment of mixtures of cotton with other fibers such as rayon, jute or terylene which will not withstand severe alkali treatment.

In Part II it is shown that the new continuous solvent-extraction technique can be applied with advantage for scouring several other fibers (eg, rayon, linen, wool, jute and glass) and that, in general, such processes can be carried out continuously in a convenient, safe and economic manner. In addition to cotton, the solvent-extraction method appears of particular promise for scouring wool piece-goods and glass fiber fabrics.

Nine references to the literature are cited.

•

Chemicals Reagents for Crease Resistance

Anon, *Textile Recorder 77*, 67-8, 73, June, 1959

For many years the only chemical compounds used for the creaseproofing of cotton and rayon fabrics have been the well-known precondensates of urea-formaldehyde (UF) and melamine-formaldehyde (MF), but more recently some new compounds (eg, dimethyl ethylene urea) which are characterized by a higher degree of reactivity with cellulose itself have come to the fore. These compounds have several points in common with the older compounds in that they all contain methylol groups and require acid catalysts for condensation.

Both UF and MF are very stable to storage and need special arrangements to prevent aging; in the acidified impregnating bath they are rather unstable and require careful control of acidity and temperature. Many of the new products do not age and can be stored indefinitely; they are stable in presence of the catalyst irrespective of temperature, and there is scarcely any odor of formaldehyde. Whereas UF and MF both begin to condense at room temperatures, the new products are more stable and require much higher temperatures, often over 100°C.

The older products are actually resin-formers, for they tend to condense or cross-link with themselves, whereas many of the new compounds have been termed reactant resins because they have a great tendency to condense with cellulose and less tendency to condense with themselves.

The author gives the structural formulas of several of these reactive resins (including dimethyl ethylene urea), and lists in tabular form their respective actions when applied to cotton and rayon, including the crease-recovery angle, tear strength of cotton, relative abrasion resistance of spun rayon, resistance to hydrolysis, and effect of acid hydrolysis on the nitrogen content.

The author also lists the effects on the properties (recovery angle, tear strength, etc) of cotton fabrics when treated respectively with methylolurea, methylol melamine, methylol-ethylene-urea, and methylol-triazone. He says that these are the chief products being used in the U S.

The effect of certain nonnitrogenous reagents (including formaldehyde and glyoxal) on the properties of cotton are also listed. It is noted that formaldehyde in particular has a serious adverse effect on the rip strength and resistance to abrasion.

Five references in the literature are cited.

•

The Scouring Process (for Cotton)

Campbell, K S, *Textile World 109*, 131-3, September, 1959

Raw stock is usually scoured ("boiled-off") in a cylindrical tank or kier holding up to 3000 lbs of cotton. To remove enough of the surface waxes, etc, to make the fiber easily wettable, a 30-minute scour at 190-200°F with two percent soda ash is recommended. If the cotton is to be bleached, a more severe treatment is required: one to four hours with four percent caustic soda and a detergent. Bleached absorbent cotton requires a pressure boil.

Cotton skeins are scoured in a variety of equipment. Cotton yarn is also processed in the form of a

continuous warp, and in package form. Details are given of these various treatments.

Cotton piece-goods, after desizing, are handled in either rope or open-width form. Goods that are relatively heavy or tightly woven require open-width treatment to avoid rub-marks and "crow's feet".

A typical kier-boil formula calls for three percent caustic soda, 0.25% detergent and 0.25% tetrasodium pyrophosphate. The goods are boiled for three to five hours at 250°F.

Fabrics containing colored yarns are usually treated below the boil with one to two percent soda ash plus a detergent and a mild oxidizing agent.

Cotton knit goods, which contain no size, are ordinarily not scoured before bleaching. A combination scour-bleach is used.

There are three methods by which cotton fabrics may be scoured continuously. The essential principle in all three is the exposure of cloth impregnated with three to four percent caustic soda to saturated steam at close to 212°F for a period of one-half to one hour. The differences in the three systems are mechanical.

In the Mathieson system, goods are handled open-width on an enclosed endless stainless-steel conveyor in an atmosphere of steam.

The Du Pont system utilizes insulated J boxes preceded by a heater tube that serves to delay the cloth in passage while maintaining a steam atmosphere and a cloth temperature of 210-212°F. J-box capacities in standard systems range from 2500 to 5000 lbs of cloth, and the goods remain in the J box for about one hour.

In the Becco type, steam is introduced directly into the J box to heat the cloth, and the box is open at the top, sealed only by the cloth itself.

In all three systems, the steaming operation is preceded by some type of saturator and followed by a continuous washer, either tight-strand rope, slack-loop rope, or open width. The efficiency of the washer really determines the permissible top speed of the range.

•

How to Choose a Pigment-Printing System

Mackay, M, Textile World 109, 71, August, 1959

Pigment-printing systems can be divided roughly into two types: water-in-oil and oil-in-water.

Printers are probably more familiar with the water-in-oil system because it has been around much longer than the oil-in-water method of applying pigments. Also, there has been more time for manufacturers to work out the "bugs" in the water-in-oil system, and for these and other reasons it is more widely used.

The pigments that are used in printing by either system are essentially the same. Each system has its good points, and each can be used to advantage over the other in some applications.

The oil-in-water method gives sharp prints, and crocking in dark shades is generally less than when the water-in-oil phase is used. But extenders or clears for oil-in-water systems are more expensive, often two to three times as costly as those used in the water-in-oil emulsion. So when it is possible, on light or medium shades, the printer will choose a water-in-oil system.

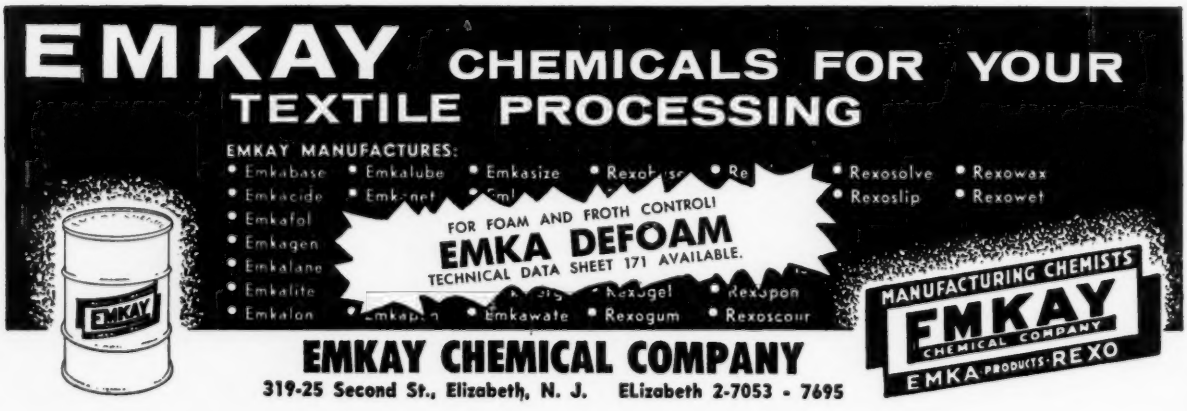
The oil-in-water method sometimes gives poor coverage in light shades because the color is more on the surface of the goods than is the case with oil-phase colors. Wash-fastness is sometimes poorer with water-phase prints because the color is not as well attached to the fiber as it is with oil-phase systems.

The two systems may be alternated in the printing machine so as to get the best results from each; eg, an oil-phase gold might be followed by a water-phase blue. The oil-phase color will not contaminate the water-phase color as much as when both are oil-phase.

Water-phase colors are easier to clean up after printing than the oil-phase type. The equipment can rinsed clean without the need for solvents or emulsifiers.

Some of the water-phase clears have a tendency to foam. Foaming can be reduced considerably by adding small amounts of antifoam materials. Foaming is very seldom a problem with oil-phase colors.

(The Editor in a later issue called attention to an error in terminology in this article. The term "oil-in-water" wherever it appeared should have read "water-in-oil", and "water-in-oil" should have read "oil-in-water".)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